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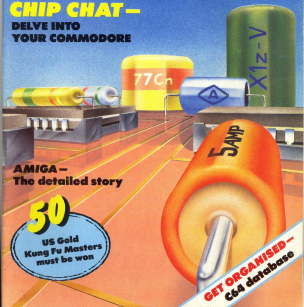
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50

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C O N T E N T S

Soft in the Head

SHOPPING FOR SOFTWARE? LOOK NO further than these pages. This month it seems as if there's never been a wider choice of programs available and you have to commend the software houses on the ingenuity of their staff.

Artisoft Info

Artisoft's is making headlines and movies this month. Did you ever think that you could play at being *Moon Spelling* with the aid of your IBM? *Movie Maker* allows you to do just that. You can create your own animated pictures with the aid of this program. You probably won't make as much money as the great directors but you should have some fun.

Claims for the program include: mixing text and graphics, creating tracks of up to 40 frames each, and combining six of these in a single animated sequence.

There are also hundreds of built-in pictures, ready for use plus the power to create your own. There are numerous animated greetings cards and a music and sound library. You can videotape your efforts and bore your friends with them - if you feel that way inclined.

It's on two disks and costs £16.95.

Two other screens from this Concept Games board house - they've just moved - are *Starship Antromeda* and *Paradromes*.

The latter is a fantastic war game set on a robot inhabited island. The Robots are tanks and hostile, of course, and you must build a better one in order to defeat them. Look out for mines and mines.

Paradromes costs £19.95 and is a product of the programming and design skills of the Ramjam Corporation.

Starship Antromeda sees you battling the evil tyrant, Alamo, who wears a crystal around her neck which just happens to be the security key to the great computer which controls the galaxy. A tough situation - especially since the only thing that will free the crystal is a Photon lance. Get the lance and get the crystal. Easy, huh?

The program includes 12 arcade/stategy games and 10,000 locations. It's also £19.95.

Not content with these launches, Artisoft is entering the Amiga software market with a collection of Electronic Arts' utilities.

Drawpoint is an accessible graphics program which allows the beginner to explore the Amiga's capabilities while giving the more experienced user an excellent tool. Features include tools to create lines, curves, shapes and textures. There's also split screen zoom enlarging and colour cycling to create animation.

Drawapoint is a sister program with 10 formats for easy customisation of print outs - in colour or black and white. The formats include greetings cards, business cards, stationery, calendars, letterheads, posters and many more.

DATA STATEMENTS



▲ Amiga range from Artisoft

▼ Artisoft, Electronic Arts and the Amiga



DeluxeVideo brings another dimension to computing. Make video slide shows, animation, business presentations. Find out about sales, fairs, and discounts. Also compression of images, control of the foreground and background and much more.

Artisynth's Ashley Gray said: "The Deluxe series of Amiga programs are the most powerful, integrated, creative tools ever released for a personal computer."

Maybe you should try them when you're saved up for your Amiga!

Activision — Out of Time!

WANTED — DEAD OR ALIVE SAM HARKER, that's you, a wanted man. Your past has caught up with you, punk. They're out to get you — but you don't know who they are. Check your files. Now, you need to prevent your own murder, and it's one of those times when you've put away behind bars during your previous career.

Investigate! Activision's latest adventure — Borrowed Time — puts you in the position of both hunter and prey. There are 20 serious suspects who are out of your blood. Track the murderer down before it's too late.

Peaks including getting that all learned, assembled, broken up, strung up, sentenced to life imprisonment, lopped on the head, ripped to pieces by mad dogs etc.

If you've got £14.99 and want to die horribly then you know how to spend it.

And the Rest

IF YOU'RE AN AMIGA WATCHER OF NOBIL Edmund's ridiculous. Late last October there, then you'll know the background to his Perivore. Now Masterframe has jumped on the bandwagon yet again to bring you Big Mac — 2 which features the character immortalised in his hilarious TV spoof. It's on the C-86 and is in the £7.99 range of course.

Halley's Comet has now hit the software industry with a release from Firebird to mark the approach of the space probe Giotto to the heart of the comet.

It's one of those games in which, once again, you play the part of an intrepid spaceman coming to the aid of the naive human race. This time the danger involves game bugs from the comet which are threatening the health of the world.

The game has three phases starting with the launch, followed by controlling the ship's computer in its flight to the comet (the spaceman is in computerised animation at the point), and finally the destruction of the gamebug as they won't reproduce and infect the globe. £7.99 on the C86, and available now.

Bliss software is taking the bull by the horns in its decision to call a spade a spade — or more accurately a shoot 'em up a shoot 'em up.



Come are the days when cappy games had cappy names. Bliss's new release is for the C86, priced at £2.99 and is undashy entitled Shoot 'Em Up.

Generally Speaking

IN THIS HIGHLY TECHNICAL SOCIETY, the Japanese are still the people who are often first with the newest ideas. Now Camana has brought another Japanese invention to this country in the form of the Ramon IC card.

Physically, the card resembles a credit card but contains integrated circuitry which enables it to be used as a solid state memory device. It has a 35 pin connector which plugs into a cheap (about £2) socket and does not need a magnetic or laser reader.

There are four different types of card: ROM, Masked ROM, EPROM and RAM.

Camana claims that they are totally reliable and durable and are unaffected by electromagnetic/interference conditions, extreme temperatures, humidity and minor scratches. It is also an added protection against software piracy.

Adapters for the cards will be available for the C84 and C128.

Camana has proposed a host of applications for the new card: Memory for telecommunications devices; identification for security keys, bank accounts, computer input and output; shopping; speech for vending machines, language labs, measuring and timing training devices; instructions for robots and other automated equipment; personal identity; applications and ROM software; portable memory for hand held devices, programmable printers, process control, alarm systems. And this is only the tip of the iceberg. Look out for them.

The Ramon Integrated Circuit Card





Mike Maloney and Tony Cresswell

After an absence of two years, Games programmer Tony Cresswell has returned to Allgate software and so you can see from the picture he seems to be having quite a good time there already.

Because of this new arrangement Allgate is promising some exciting releases in the near future.

If you've bought an A/EI game recently or in the past there's a new service being offered to you by the company to help you out with any problems which you may have run into.

A new mail order and queries line has been established which will provide a 24 hour service. The number is 0800 40600 407111. There's also been an announcement from A/EI that a new arcade adventure is in the pipeline at the moment. We'll bring you more news on that as soon as we have it.

A company called Macosco has come up with an original idea. It has launched a software/audio cassette. It combines three tunes in 'full, baroque dance' dance mix from some popular games - namely Rambo, Revenge of the Cheetahmen, Crazy Costello and Hyper-sports - with a database called help-a-ware which should help you organise a software system for your programs, games, or record collections.

The idea behind it is apparently to combine the purely functional with pure entertainment. Whether the gamers will think this worthwhile is another question but at £14.95 from H H Smiths it may be worth a shot.

On Line

ACRONIT USERS HAVE RAILED round and barked out to make the lives of some disabled young people a lot easier.

A user called Jon Ilye, who became non-verbal as the result of an accident several years ago, let ACRONIT know, via mailbox, that communication services had made an incredible difference to his life.

His comments created a lot of interest amongst other users. John lives at Hatchford Park School in Guildford and an appeal put up on Microsoft to raise £200 for 10 other non-verbal residents was greeted with a fantastic response.

Not only did members donate over £700 in 24 hours, but also Keith Rose of Modern Music offered all the required moderns too.

Hard Lines

COMMODORE 128 OWNERS WHO have had trouble finding a suitable monitor for their computer (other than Commodore's own product) could feel that Casiole has come to their aid.

The RGB output of the 128 is incompatible with the majority of monitors on the market. Commodore's 1281 monitor is expensive and people who already own a Microline probably feel that this is a high price to pay.

Casiole has come up with an interface which provides a full RGB 80 column display via the RGB 151 input. Microline 140 dual mode monitor can now provide full 80 column composite video and 80 column RGB with simple switching between modes, thus allowing full use of the 128's three operating modes.

At £79.95 it could be a worthwhile investment.

Most computer owners will be intrigued by Commodore's new Complete Music System. It costs £130 including a C64 and the Music Expansion system priced at £149.95 for those who already own a C64 or C128. Contains everything needed to produce music which is normally only possible on expensive synthesizers. Or so Commodore claims.

Launched at the Ideal Home Exhibition the products should be in your local shop now.

Rich Williams tackles Commodore's Music System



COMPETITION

Marital arts without pain can be yours if you enter our US Gold competition

SINCE KUNG FU IS AN EVER-POPULAR topic for computer games, we've decided to give you the chance to win your own copy of US Gold's excellent kung fu master.

We've got 50 copies for the readers who pick out the differences between the two cartoons and get their names picked out of the bag first.

What are you waiting for?

How to Enter

Study the two cartoons. There are several differences between them. Mark the differences clearly on the picture attached to the entry coupon. Fill in the coupon and send it off to US Gold Competition, Your Commodore, 1 Golden Square, London W1R 1AB. Write the number of differences you found on the back of your envelope.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications or US Gold. This restriction applies to employee's families and agents of the company.

The How to Enter section forms part of the rules. The editor's decision is final and no correspondence will be entered into.



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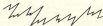
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Send your entry to: US Gold Competition, Your Commodore, 1 Golden Square, London W1R 1AB. Closing date: Friday 27 June 1986. Write clearly and don't forget to put the number of differences on the back of your envelope.

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TRIPPL 0000

In the first of a new series, Eric Doyle introduces you to the secret of your Commodore's memory.

CHIP CHAT

WE ALL TAKE THE CHIPS inside our computers for granted but a greater understanding of them can lead to better programs. Over the next few months, I hope to clarify the function of each chip and to reveal the inner workings and hidden secrets of the Commodore range of computers: the VIC 20, C64, C-65, Plus4 and C128.

The heart of any computer is the central processor and the most common application of the computer is to run Basic programs, so this is where our Chipchat will begin.

The microprocessor in Commodore micros is a one of several derivatives of the Motorola 6800 series microchip. This processor is the master cracker inside which are the registers that exist in all of the computer's mathematical operations. Diagram 1 shows the basic architecture of all 6800 range microprocessors.

As far as the processor is concerned the whole of the computer memory is an extension of itself from which numerical values can be loaded (read) or sent (written).

A good way of imagining memory is as a large, pigeon-hole internal mailing system. Each box represents a byte of memory and can contain a value from zero to 255. Don't worry if you don't know how computers deal with numbers larger than 255, all will become clear later.

Memory comes in two varieties. Read Only Memory (ROM) and Random Access Memory (RAM). As the name implies, ROM can only be read from but RAM can either be read from or written to; it is necessary to change its value. For example variables defined by a Basic program must be stored in RAM for two reasons. Firstly, because it must have a value written to it to start with and, secondly, because that value may change later on in the program.

Another difference is that ROM is a permanent, non-volatile store which cannot be erased by turning the power on and off but RAM is volatile and its contents disappear when the computer is switched off.

ROM is where the Basic operating system is stored and all power up it reserves certain parts of RAM for storing the constant values generated as its routines are executed.

Processing

Load and run Listing 1 to see how the processor operates.

The program counter tells the processor where the current instruction is located in RAM/ROM memory. When commanded to execute a copy of machine code, the current value of the program counter is stored in a special reserved

area of RAM memory (the processor stack area) and the internal stack pointer is adjusted to point to the next free location in the stack. The start address of the new machine code routine is then placed into the counter. This value is then loaded into the address buffer which directs the data bus to the correct location.

The data bus copies the information found in the given location and carries this back to the processor which is expecting a machine code operator. When this is evaluated in the instruction decoder it determines whether an operand or two will follow. Depending on the type of operator, any operands are evaluated and stored in the 8 or 9 registers as in the accumulators.

If the operator is a finite address the address buffer is given this value and the data bus reacts accordingly. If the value is an offset address, the finite address has the value of the 8 or 9 register added to it and this value is passed to the address buffer.

All mathematical work is performed in the ALU which can access all of the registers which merely act as passive stores for numerical values.

The instruction decoder determines whether the data bus is reading or writing its encoded information and which internal register provides or accepts the information.

When an RTS command is detected the last value to be stored on the stack is read into the program counter and the processor continues from where it was before it was asked to execute the routine.

I have said that the processor only responds to machine code routines so how does it respond to Basic?

PROGRAM: LISTING 1

```
10 CH=15:GOSUB30
20 LL=PEEK(15+1)+PEEK(15+2)*256
30 LL=
40 LL=PEEK(15+3)+PEEK(15+4)*256
50 PRINT"CALL HWTLINE*LL"
60 GOTO 1
70 LL=15+1:GOSUB30:FLC=INT
80 HW=
90 PRINT"HEL" (DOWN) (DOWN) FL
100 GOTO 1
110 HW=15+1:PEEK(15+1)=HW:PEEK(15+2)=15+1:PEEK(15+3)=15+2:PEEK(15+4)=15+3:PEEK(15+5)=15+4:PEEK(15+6)=15+5:PEEK(15+7)=15+6:PEEK(15+8)=15+7:PEEK(15+9)=15+8:PEEK(15+10)=15+9:PEEK(15+11)=15+10:PEEK(15+12)=15+11:PEEK(15+13)=15+12:PEEK(15+14)=15+13:PEEK(15+15)=15+14:PEEK(15+16)=15+15:PEEK(15+17)=15+16:PEEK(15+18)=15+17:PEEK(15+19)=15+18:PEEK(15+20)=15+19:PEEK(15+21)=15+20:PEEK(15+22)=15+21:PEEK(15+23)=15+22:PEEK(15+24)=15+23:PEEK(15+25)=15+24:PEEK(15+26)=15+25:PEEK(15+27)=15+26:PEEK(15+28)=15+27:PEEK(15+29)=15+28:PEEK(15+30)=15+29:PEEK(15+31)=15+30:PEEK(15+32)=15+31:PEEK(15+33)=15+32:PEEK(15+34)=15+33:PEEK(15+35)=15+34:PEEK(15+36)=15+35:PEEK(15+37)=15+36:PEEK(15+38)=15+37:PEEK(15+39)=15+38:PEEK(15+40)=15+39:PEEK(15+41)=15+40:PEEK(15+42)=15+41:PEEK(15+43)=15+42:PEEK(15+44)=15+43:PEEK(15+45)=15+44:PEEK(15+46)=15+45:PEEK(15+47)=15+46:PEEK(15+48)=15+47:PEEK(15+49)=15+48:PEEK(15+50)=15+49:PEEK(15+51)=15+50:PEEK(15+52)=15+51:PEEK(15+53)=15+52:PEEK(15+54)=15+53:PEEK(15+55)=15+54:PEEK(15+56)=15+55:PEEK(15+57)=15+56:PEEK(15+58)=15+57:PEEK(15+59)=15+58:PEEK(15+60)=15+59:PEEK(15+61)=15+60:PEEK(15+62)=15+61:PEEK(15+63)=15+62:PEEK(15+64)=15+63:PEEK(15+65)=15+64:PEEK(15+66)=15+65:PEEK(15+67)=15+66:PEEK(15+68)=15+67:PEEK(15+69)=15+68:PEEK(15+70)=15+69:PEEK(15+71)=15+70:PEEK(15+72)=15+71:PEEK(15+73)=15+72:PEEK(15+74)=15+73:PEEK(15+75)=15+74:PEEK(15+76)=15+75:PEEK(15+77)=15+76:PEEK(15+78)=15+77:PEEK(15+79)=15+78:PEEK(15+80)=15+79:PEEK(15+81)=15+80:PEEK(15+82)=15+81:PEEK(15+83)=15+82:PEEK(15+84)=15+83:PEEK(15+85)=15+84:PEEK(15+86)=15+85:PEEK(15+87)=15+86:PEEK(15+88)=15+87:PEEK(15+89)=15+88:PEEK(15+90)=15+89:PEEK(15+91)=15+90:PEEK(15+92)=15+91:PEEK(15+93)=15+92:PEEK(15+94)=15+93:PEEK(15+95)=15+94:PEEK(15+96)=15+95:PEEK(15+97)=15+96:PEEK(15+98)=15+97:PEEK(15+99)=15+98:PEEK(15+100)=15+99:PEEK(15+101)=15+100:PEEK(15+102)=15+101:PEEK(15+103)=15+102:PEEK(15+104)=15+103:PEEK(15+105)=15+104:PEEK(15+106)=15+105:PEEK(15+107)=15+106:PEEK(15+108)=15+107:PEEK(15+109)=15+108:PEEK(15+110)=15+109:PEEK(15+111)=15+110:PEEK(15+112)=15+111:PEEK(15+113)=15+112:PEEK(15+114)=15+113:PEEK(15+115)=15+114:PEEK(15+116)=15+115:PEEK(15+117)=15+116:PEEK(15+118)=15+117:PEEK(15+119)=15+118:PEEK(15+120)=15+119:PEEK(15+121)=15+120:PEEK(15+122)=15+121:PEEK(15+123)=15+122:PEEK(15+124)=15+123:PEEK(15+125)=15+124:PEEK(15+126)=15+125:PEEK(15+127)=15+126:PEEK(15+128)=15+127:PEEK(15+129)=15+128:PEEK(15+130)=15+129:PEEK(15+131)=15+130:PEEK(15+132)=15+131:PEEK(15+133)=15+132:PEEK(15+134)=15+133:PEEK(15+135)=15+134:PEEK(15+136)=15+135:PEEK(15+137)=15+136:PEEK(15+138)=15+137:PEEK(15+139)=15+138:PEEK(15+140)=15+139:PEEK(15+141)=15+140:PEEK(15+142)=15+141:PEEK(15+143)=15+142:PEEK(15+144)=15+143:PEEK(15+145)=15+144:PEEK(15+146)=15+145:PEEK(15+147)=15+146:PEEK(15+148)=15+147:PEEK(15+149)=15+148:PEEK(15+150)=15+149:PEEK(15+151)=15+150:PEEK(15+152)=15+151:PEEK(15+153)=15+152:PEEK(15+154)=15+153:PEEK(15+155)=15+154:PEEK(15+156)=15+155:PEEK(15+157)=15+156:PEEK(15+158)=15+157:PEEK(15+159)=15+158:PEEK(15+160)=15+159:PEEK(15+161)=15+160:PEEK(15+162)=15+161:PEEK(15+163)=15+162:PEEK(15+164)=15+163:PEEK(15+165)=15+164:PEEK(15+166)=15+165:PEEK(15+167)=15+166:PEEK(15+168)=15+167:PEEK(15+169)=15+168:PEEK(15+170)=15+169:PEEK(15+171)=15+170:PEEK(15+172)=15+171:PEEK(15+173)=15+172:PEEK(15+174)=15+173:PEEK(15+175)=15+174:PEEK(15+176)=15+175:PEEK(15+177)=15+176:PEEK(15+178)=15+177:PEEK(15+179)=15+178:PEEK(15+180)=15+179:PEEK(15+181)=15+180:PEEK(15+182)=15+181:PEEK(15+183)=15+182:PEEK(15+184)=15+183:PEEK(15+185)=15+184:PEEK(15+186)=15+185:PEEK(15+187)=15+186:PEEK(15+188)=15+187:PEEK(15+189)=15+188:PEEK(15+190)=15+189:PEEK(15+191)=15+190:PEEK(15+192)=15+191:PEEK(15+193)=15+192:PEEK(15+194)=15+193:PEEK(15+195)=15+194:PEEK(15+196)=15+195:PEEK(15+197)=15+196:PEEK(15+198)=15+197:PEEK(15+199)=15+198:PEEK(15+200)=15+199:PEEK(15+201)=15+200:PEEK(15+202)=15+201:PEEK(15+203)=15+202:PEEK(15+204)=15+203:PEEK(15+205)=15+204:PEEK(15+206)=15+205:PEEK(15+207)=15+206:PEEK(15+208)=15+207:PEEK(15+209)=15+208:PEEK(15+210)=15+209:PEEK(15+211)=15+210:PEEK(15+212)=15+211:PEEK(15+213)=15+212:PEEK(15+214)=15+213:PEEK(15+215)=15+214:PEEK(15+216)=15+215:PEEK(15+217)=15+216:PEEK(15+218)=15+217:PEEK(15+219)=15+218:PEEK(15+220)=15+219:PEEK(15+221)=15+220:PEEK(15+222)=15+221:PEEK(15+223)=15+222:PEEK(15+224)=15+223:PEEK(15+225)=15+224:PEEK(15+226)=15+225:PEEK(15+227)=15+226:PEEK(15+228)=15+227:PEEK(15+229)=15+228:PEEK(15+230)=15+229:PEEK(15+231)=15+230:PEEK(15+232)=15+231:PEEK(15+233)=15+232:PEEK(15+234)=15+233:PEEK(15+235)=15+234:PEEK(15+236)=15+235:PEEK(15+237)=15+236:PEEK(15+238)=15+237:PEEK(15+239)=15+238:PEEK(15+240)=15+239:PEEK(15+241)=15+240:PEEK(15+242)=15+241:PEEK(15+243)=15+242:PEEK(15+244)=15+243:PEEK(15+245)=15+244:PEEK(15+246)=15+245:PEEK(15+247)=15+246:PEEK(15+248)=15+247:PEEK(15+249)=15+248:PEEK(15+250)=15+249:PEEK(15+251)=15+250:PEEK(15+252)=15+251:PEEK(15+253)=15+252:PEEK(15+254)=15+253:PEEK(15+255)=15+254:PEEK(15+256)=15+255:PEEK(15+257)=15+256:PEEK(15+258)=15+257:PEEK(15+259)=15+258:PEEK(15+260)=15+259:PEEK(15+261)=15+260:PEEK(15+262)=15+261:PEEK(15+263)=15+262:PEEK(15+264)=15+263:PEEK(15+265)=15+264:PEEK(15+266)=15+265:PEEK(15+267)=15+266:PEEK(15+268)=15+267:PEEK(15+269)=15+268:PEEK(15+270)=15+269:PEEK(15+271)=15+270:PEEK(15+272)=15+271:PEEK(15+273)=15+272:PEEK(15+274)=15+273:PEEK(15+275)=15+274:PEEK(15+276)=15+275:PEEK(15+277)=15+276:PEEK(15+278)=15+277:PEEK(15+279)=15+278:PEEK(15+280)=15+279:PEEK(15+281)=15+280:PEEK(15+282)=15+281:PEEK(15+283)=15+282:PEEK(15+284)=15+283:PEEK(15+285)=15+284:PEEK(15+286)=15+285:PEEK(15+287)=15+286:PEEK(15+288)=15+287:PEEK(15+289)=15+288:PEEK(15+290)=15+289:PEEK(15+291)=15+290:PEEK(15+292)=15+291:PEEK(15+293)=15+292:PEEK(15+294)=15+293:PEEK(15+295)=15+294:PEEK(15+296)=15+295:PEEK(15+297)=15+296:PEEK(15+298)=15+297:PEEK(15+299)=15+298:PEEK(15+300)=15+299:PEEK(15+301)=15+300:PEEK(15+302)=15+301:PEEK(15+303)=15+302:PEEK(15+304)=15+303:PEEK(15+305)=15+304:PEEK(15+306)=15+305:PEEK(15+307)=15+306:PEEK(15+308)=15+307:PEEK(15+309)=15+308:PEEK(15+310)=15+309:PEEK(15+311)=15+310:PEEK(15+312)=15+311:PEEK(15+313)=15+312:PEEK(15+314)=15+313:PEEK(15+315)=15+314:PEEK(15+316)=15+315:PEEK(15+317)=15+316:PEEK(15+318)=15+317:PEEK(15+319)=15+318:PEEK(15+320)=15+319:PEEK(15+321)=15+320:PEEK(15+322)=15+321:PEEK(15+323)=15+322:PEEK(15+324)=15+323:PEEK(15+325)=15+324:PEEK(15+326)=15+325:PEEK(15+327)=15+326:PEEK(15+328)=15+327:PEEK(15+329)=15+328:PEEK(15+330)=15+329:PEEK(15+331)=15+330:PEEK(15+332)=15+331:PEEK(15+333)=15+332:PEEK(15+334)=15+333:PEEK(15+335)=15+334:PEEK(15+336)=15+335:PEEK(15+337)=15+336:PEEK(15+338)=15+337:PEEK(15+339)=15+338:PEEK(15+340)=15+339:PEEK(15+341)=15+340:PEEK(15+342)=15+341:PEEK(15+343)=15+342:PEEK(15+344)=15+343:PEEK(15+345)=15+344:PEEK(15+346)=15+345:PEEK(15+347)=15+346:PEEK(15+348)=15+347:PEEK(15+349)=15+348:PEEK(15+350)=15+349:PEEK(15+351)=15+350:PEEK(15+352)=15+351:PEEK(15+353)=15+352:PEEK(15+354)=15+353:PEEK(15+355)=15+354:PEEK(15+356)=15+355:PEEK(15+357)=15+356:PEEK(15+358)=15+357:PEEK(15+359)=15+358:PEEK(15+360)=15+359:PEEK(15+361)=15+360:PEEK(15+362)=15+361:PEEK(15+363)=15+362:PEEK(15+364)=15+363:PEEK(15+365)=15+364:PEEK(15+366)=15+365:PEEK(15+367)=15+366:PEEK(15+368)=15+367:PEEK(15+369)=15+368:PEEK(15+370)=15+369:PEEK(15+371)=15+370:PEEK(15+372)=15+371:PEEK(15+373)=15+372:PEEK(15+374)=15+373:PEEK(15+375)=15+374:PEEK(15+376)=15+375:PEEK(15+377)=15+376:PEEK(15+378)=15+377:PEEK(15+379)=15+378:PEEK(15+380)=15+379:PEEK(15+381)=15+380:PEEK(15+382)=15+381:PEEK(15+383)=15+382:PEEK(15+384)=15+383:PEEK(15+385)=15+384:PEEK(15+386)=15+385:PEEK(15+387)=15+386:PEEK(15+388)=15+387:PEEK(15+389)=15+388:PEEK(15+390)=15+389:PEEK(15+391)=15+390:PEEK(15+392)=15+391:PEEK(15+393)=15+392:PEEK(15+394)=15+393:PEEK(15+395)=15+394:PEEK(15+396)=15+395:PEEK(15+397)=15+396:PEEK(15+398)=15+397:PEEK(15+399)=15+398:PEEK(15+400)=15+399:PEEK(15+401)=15+400:PEEK(15+402)=15+401:PEEK(15+403)=15+402:PEEK(15+404)=15+403:PEEK(15+405)=15+404:PEEK(15+406)=15+405:PEEK(15+407)=15+406:PEEK(15+408)=15+407:PEEK(15+409)=15+408:PEEK(15+410)=15+409:PEEK(15+411)=15+410:PEEK(15+412)=15+411:PEEK(15+413)=15+412:PEEK(15+414)=15+413:PEEK(15+415)=15+414:PEEK(15+416)=15+415:PEEK(15+417)=15+416:PEEK(15+418)=15+417:PEEK(15+419)=15+418:PEEK(15+420)=15+419:PEEK(15+421)=15+420:PEEK(15+422)=15+421:PEEK(15+423)=15+422:PEEK(15+424)=15+423:PEEK(15+425)=15+424:PEEK(15+426)=15+425:PEEK(15+427)=15+426:PEEK(15+428)=15+427:PEEK(15+429)=15+428:PEEK(15+430)=15+429:PEEK(15+431)=15+430:PEEK(15+432)=15+431:PEEK(15+433)=15+432:PEEK(15+434)=15+433:PEEK(15+435)=15+434:PEEK(15+436)=15+435:PEEK(15+437)=15+436:PEEK(15+438)=15+437:PEEK(15+439)=15+438:PEEK(15+440)=15+439:PEEK(15+441)=15+440:PEEK(15+442)=15+441:PEEK(15+443)=15+442:PEEK(15+444)=15+443:PEEK(15+445)=15+444:PEEK(15+446)=15+445:PEEK(15+447)=15+446:PEEK(15+448)=15+447:PEEK(15+449)=15+448:PEEK(15+450)=15+449:PEEK(15+451)=15+450:PEEK(15+452)=15+451:PEEK(15+453)=15+452:PEEK(15+454)=15+453:PEEK(15+455)=15+454:PEEK(15+456)=15+455:PEEK(15+457)=15+456:PEEK(15+458)=15+457:PEEK(15+459)=15+458:PEEK(15+460)=15+459:PEEK(15+461)=15+460:PEEK(15+462)=15+461:PEEK(15+463)=15+462:PEEK(15+464)=15+463:PEEK(15+465)=15+464:PEEK(15+466)=15+465:PEEK(15+467)=15+466:PEEK(15+468)=15+467:PEEK(15+469)=15+468:PEEK(15+470)=15+469:PEEK(15+471)=15+470:PEEK(15+472)=15+471:PEEK(15+473)=15+472:PEEK(15+474)=15+473:PEEK(15+475)=15+474:PEEK(15+476)=15+475:PEEK(15+477)=15+476:PEEK(15+478)=15+477:PEEK(15+479)=15+478:PEEK(15+480)=15+479:PEEK(15+481)=15+480:PEEK(15+482)=15+481:PEEK(15+483)=15+482:PEEK(15+484)=15+483:PEEK(15+485)=15+484:PEEK(15+486)=15+485:PEEK(15+487)=15+486:PEEK(15+488)=15+487:PEEK(15+489)=15+488:PEEK(15+490)=15+489:PEEK(15+491)=15+490:PEEK(15+492)=15+491:PEEK(15+493)=15+492:PEEK(15+494)=15+493:PEEK(15+495)=15+494:PEEK(15+496)=15+495:PEEK(15+497)=15+496:PEEK(15+498)=15+497:PEEK(15+499)=15+498:PEEK(15+500)=15+499:PEEK(15+501)=15+500:PEEK(15+502)=15+501:PEEK(15+503)=15+502:PEEK(15+504)=15+503:PEEK(15+505)=15+504:PEEK(15+506)=15+505:PEEK(15+507)=15+506:PEEK(15+508)=15+507:PEEK(15+509)=15+508:PEEK(15+510)=15+509:PEEK(15+511)=15+510:PEEK(15+512)=15+511:PEEK(15+513)=15+512:PEEK(15+514)=15+513:PEEK(15+515)=15+514:PEEK(15+516)=15+515:PEEK(15+517)=15+516:PEEK(15+518)=15+517:PEEK(15+519)=15+518:PEEK(15+520)=15+519:PEEK(15+521)=15+520:PEEK(15+522)=15+521:PEEK(15+523)=15+522:PEEK(15+524)=15+523:PEEK(15+525)=15+524:PEEK(15+526)=15+525:PEEK(15+527)=15+526:PEEK(15+528)=15+527:PEEK(15+529)=15+528:PEEK(15+530)=15+529:PEEK(15+531)=15+530:PEEK(15+532)=15+531:PEEK(15+533)=15+532:PEEK(15+534)=15+533:PEEK(15+535)=15+534:PEEK(15+536)=15+535:PEEK(15+537)=15+536:PEEK(15+538)=15+537:PEEK(15+539)=15+538:PEEK(15+540)=15+539:PEEK(15+541)=15+540:PEEK(15+542)=15+541:PEEK(15+543)=15+542:PEEK(15+544)=15+543:PEEK(15+545)=15+544:PEEK(15+546)=15+545:PEEK(15+547)=15+546:PEEK(15+548)=15+547:PEEK(15+549)=15+548:PEEK(15+550)=15+549:PEEK(15+551)=15+550:PEEK(15+552)=15+551:PEEK(15+553)=15+552:PEEK(15+554)=15+553:PEEK(15+555)=15+554:PEEK(15+556)=15+555:PEEK(15+557)=15+556:PEEK(15+558)=15+557:PEEK(15+559)=15+558:PEEK(15+560)=15+559:PEEK(15+561)=15+560:PEEK(15+562)=15+561:PEEK(15+563)=15+562:PEEK(15+564)=15+563:PEEK(15+565)=15+564:PEEK(15+566)=15+565:PEEK(15+567)=15+566:PEEK(15+568)=15+567:PEEK(15+569)=15+568:PEEK(15+570)=15+569:PEEK(15+571)=15+570:PEEK(15+572)=15+571:PEEK(15+573)=15+572:PEEK(15+574)=15+573:PEEK(15+575)=15+574:PEEK(15+576)=15+575:PEEK(15+577)=15+576:PEEK(15+578)=15+577:PEEK(15+579)=15+578:PEEK(15+580)=15+579:PEEK(15+581)=15+580:PEEK(15+582)=15+581:PEEK(15+583)=15+582:PEEK(15+584)=15+583:PEEK(15+585)=15+584:PEEK(15+586)=15+585:PEEK(15+587)=15+586:PEEK(15+588)=15+587:PEEK(15+589)=15+588:PEEK(15+590)=15+589:PEEK(15+591)=15+590:PEEK(15+592)=15+591:PEEK(15+593)=15+592:PEEK(15+594)=15+593:PEEK(15+595)=15+594:PEEK(15+596)=15+595:PEEK(15+597)=15+596:PEEK(15+598)=15+597:PEEK(15+599)=15+598:PEEK(15+600)=15+599:PEEK(15+601)=15+600:PEEK(15+602)=15+601:PEEK(15+603)=15+602:PEEK(15+604)=15+603:PEEK(15+605)=15+604:PEEK(15+606)=15+605:PEEK(15+607)=15+606:PEEK(15+608)=15+607:PEEK(15+609)=15+608:PEEK(15+610)=15+609:PEEK(15+611)=15+610:PEEK(15+612)=15+611:PEEK(15+613)=15+612:PEEK(15+614)=15+613:PEEK(15+615)=15+614:PEEK(15+616)=15+615:PEEK(15+617)=15+616:PEEK(15+618)=15+617:PEEK(15+619)=15+618:PEEK(15+620)=15+619:PEEK(15+621)=15+620:PEEK(15+622)=15+621:PEEK(15+623)=15+622:PEEK(15+624)=15+623:PEEK(15+625)=15+624:PEEK(15+626)=15+625:PEEK(15+627)=15+626:PEEK(15+628)=15+627:PEEK(15+629)=15+628:PEEK(15+630)=15+629:PEEK(15+631)=15+630:PEEK(15+632)=15+631:PEEK(15+633)=15+632:PEEK(15+634)=15+633:PEEK(15+635)=15+634:PEEK(15+636)=15+635:PEEK(15+637)=15+636:PEEK(15+638)=15+637:PEEK(15+639)=1
```


variable being created in checks the syntax of the variable name. Then an area of RAM is used to store the value along with the variable name.

If a reserved word has been found the position of the token value in the RAM line determines where the program jumps to in the Basic ROM to carry the correct syntax of any characters which follow the word and a color or zero byte is discovered. For example, if the line was PRINT "HELLO", the PRINT token would be 99. Here, the system would then expect a variable name, a quotation mark, a color or a zero. In this case it finds a space, which is ignored, followed by a quotation mark. The system then takes the ASCII code from between the quotes and stores it. The ASCII is converted into a system POKE value and this places the letters which spell HELLO at the next available screen location.

When the end of a line is found the line link is restored from memory and the next line link is scanned along with the new line number. The line is then copied into the Basic buffer and the line is scanned and interpreted as before.

This process continues until there are no more lines left or an END or STOP command is located.

Obviously with all this memory movement, evaluation and syntax checking going on the program runs a lot more slowly than a pure machine code program written specifically to create the same effect but it should be remembered that all programs are executed by the microprocessor in machine code. Basic is only a fragment of the ROM's memory. When a language such as Logo or Pascal is loaded the Basic ROM is switched out in favour of the new machine code routines which interpret the syntax of the new language.

Any language on a computer is a language of convenience; rather like Margaret Thatcher and President Mitterand discussing policies through the medium of an interpreter. As we all know this not only lengthens the time taken for the discussion but can also lead to misunderstandings, unless great care is taken.

Next month we shall see how the processor helps to store numerical and string variables.

```

400 FOR A=100 TO 500000:PRINT
401 FOR B=1000 TO 1000:NEXT B:REM LB
402 FOR C=100000
403 FOR D=1 TO 100:STEP 1:IF D=1
404 LET D="NEXT D":BL=0:STAY=0
405 GOTO 10
406 FOR E=100000 TO 100000
407 FOR F=1 TO 1000:STEP 1:IF F=1
408 LET F="NEXT F":BL=0:STAY=0
409 GOTO 10
410 FOR G=1 TO 1000:STEP 1:IF G=1
411 LET G="NEXT G":BL=0:STAY=0
412 GOTO 10
413 FOR H=1 TO 1000:STEP 1:IF H=1
414 LET H="NEXT H":BL=0:STAY=0
415 GOTO 10
416 FOR I=1 TO 1000:STEP 1:IF I=1
417 LET I="NEXT I":BL=0:STAY=0
418 GOTO 10
419 FOR J=1 TO 1000:STEP 1:IF J=1
420 LET J="NEXT J":BL=0:STAY=0
421 GOTO 10
422 FOR K=1 TO 1000:STEP 1:IF K=1
423 LET K="NEXT K":BL=0:STAY=0
424 GOTO 10
425 FOR L=1 TO 1000:STEP 1:IF L=1
426 LET L="NEXT L":BL=0:STAY=0
427 GOTO 10
428 FOR M=1 TO 1000:STEP 1:IF M=1
429 LET M="NEXT M":BL=0:STAY=0
430 GOTO 10
431 FOR N=1 TO 1000:STEP 1:IF N=1
432 LET N="NEXT N":BL=0:STAY=0
433 GOTO 10
434 FOR O=1 TO 1000:STEP 1:IF O=1
435 LET O="NEXT O":BL=0:STAY=0
436 GOTO 10
437 FOR P=1 TO 1000:STEP 1:IF P=1
438 LET P="NEXT P":BL=0:STAY=0
439 GOTO 10
440 FOR Q=1 TO 1000:STEP 1:IF Q=1
441 LET Q="NEXT Q":BL=0:STAY=0
442 GOTO 10
443 FOR R=1 TO 1000:STEP 1:IF R=1
444 LET R="NEXT R":BL=0:STAY=0
445 GOTO 10
446 FOR S=1 TO 1000:STEP 1:IF S=1
447 LET S="NEXT S":BL=0:STAY=0
448 GOTO 10
449 FOR T=1 TO 1000:STEP 1:IF T=1
450 LET T="NEXT T":BL=0:STAY=0
451 GOTO 10
452 FOR U=1 TO 1000:STEP 1:IF U=1
453 LET U="NEXT U":BL=0:STAY=0
454 GOTO 10
455 FOR V=1 TO 1000:STEP 1:IF V=1
456 LET V="NEXT V":BL=0:STAY=0
457 GOTO 10
458 FOR W=1 TO 1000:STEP 1:IF W=1
459 LET W="NEXT W":BL=0:STAY=0
460 GOTO 10
461 FOR X=1 TO 1000:STEP 1:IF X=1
462 LET X="NEXT X":BL=0:STAY=0
463 GOTO 10
464 FOR Y=1 TO 1000:STEP 1:IF Y=1
465 LET Y="NEXT Y":BL=0:STAY=0
466 GOTO 10
467 FOR Z=1 TO 1000:STEP 1:IF Z=1
468 LET Z="NEXT Z":BL=0:STAY=0
469 GOTO 10
470 FOR AA=1 TO 1000:STEP 1:IF AA=1
471 LET AA="NEXT AA":BL=0:STAY=0
472 GOTO 10
473 FOR AB=1 TO 1000:STEP 1:IF AB=1
474 LET AB="NEXT AB":BL=0:STAY=0
475 GOTO 10
476 FOR AC=1 TO 1000:STEP 1:IF AC=1
477 LET AC="NEXT AC":BL=0:STAY=0
478 GOTO 10
479 FOR AD=1 TO 1000:STEP 1:IF AD=1
480 LET AD="NEXT AD":BL=0:STAY=0
481 GOTO 10
482 FOR AE=1 TO 1000:STEP 1:IF AE=1
483 LET AE="NEXT AE":BL=0:STAY=0
484 GOTO 10
485 FOR AF=1 TO 1000:STEP 1:IF AF=1
486 LET AF="NEXT AF":BL=0:STAY=0
487 GOTO 10
488 FOR AG=1 TO 1000:STEP 1:IF AG=1
489 LET AG="NEXT AG":BL=0:STAY=0
490 GOTO 10
491 FOR AH=1 TO 1000:STEP 1:IF AH=1
492 LET AH="NEXT AH":BL=0:STAY=0
493 GOTO 10
494 FOR AI=1 TO 1000:STEP 1:IF AI=1
495 LET AI="NEXT AI":BL=0:STAY=0
496 GOTO 10
497 FOR AJ=1 TO 1000:STEP 1:IF AJ=1
498 LET AJ="NEXT AJ":BL=0:STAY=0
499 GOTO 10
500 FOR AK=1 TO 1000:STEP 1:IF AK=1
501 LET AK="NEXT AK":BL=0:STAY=0
502 GOTO 10
503 FOR AL=1 TO 1000:STEP 1:IF AL=1
504 LET AL="NEXT AL":BL=0:STAY=0
505 GOTO 10
506 FOR AM=1 TO 1000:STEP 1:IF AM=1
507 LET AM="NEXT AM":BL=0:STAY=0
508 GOTO 10
509 FOR AN=1 TO 1000:STEP 1:IF AN=1
510 LET AN="NEXT AN":BL=0:STAY=0
511 GOTO 10
512 FOR AO=1 TO 1000:STEP 1:IF AO=1
513 LET AO="NEXT AO":BL=0:STAY=0
514 GOTO 10
515 FOR AP=1 TO 1000:STEP 1:IF AP=1
516 LET AP="NEXT AP":BL=0:STAY=0
517 GOTO 10
518 FOR AQ=1 TO 1000:STEP 1:IF AQ=1
519 LET AQ="NEXT AQ":BL=0:STAY=0
520 GOTO 10
521 FOR AR=1 TO 1000:STEP 1:IF AR=1
522 LET AR="NEXT AR":BL=0:STAY=0
523 GOTO 10
524 FOR AS=1 TO 1000:STEP 1:IF AS=1
525 LET AS="NEXT AS":BL=0:STAY=0
526 GOTO 10
527 FOR AT=1 TO 1000:STEP 1:IF AT=1
528 LET AT="NEXT AT":BL=0:STAY=0
529 GOTO 10
530 FOR AU=1 TO 1000:STEP 1:IF AU=1
531 LET AU="NEXT AU":BL=0:STAY=0
532 GOTO 10
533 FOR AV=1 TO 1000:STEP 1:IF AV=1
534 LET AV="NEXT AV":BL=0:STAY=0
535 GOTO 10
536 FOR AW=1 TO 1000:STEP 1:IF AW=1
537 LET AW="NEXT AW":BL=0:STAY=0
538 GOTO 10
539 FOR AX=1 TO 1000:STEP 1:IF AX=1
540 LET AX="NEXT AX":BL=0:STAY=0
541 GOTO 10
542 FOR AY=1 TO 1000:STEP 1:IF AY=1
543 LET AY="NEXT AY":BL=0:STAY=0
544 GOTO 10
545 FOR AZ=1 TO 1000:STEP 1:IF AZ=1
546 LET AZ="NEXT AZ":BL=0:STAY=0
547 GOTO 10
548 FOR BA=1 TO 1000:STEP 1:IF BA=1
549 LET BA="NEXT BA":BL=0:STAY=0
550 GOTO 10
551 FOR BB=1 TO 1000:STEP 1:IF BB=1
552 LET BB="NEXT BB":BL=0:STAY=0
553 GOTO 10
554 FOR BC=1 TO 1000:STEP 1:IF BC=1
555 LET BC="NEXT BC":BL=0:STAY=0
556 GOTO 10
557 FOR BD=1 TO 1000:STEP 1:IF BD=1
558 LET BD="NEXT BD":BL=0:STAY=0
559 GOTO 10
560 FOR BE=1 TO 1000:STEP 1:IF BE=1
561 LET BE="NEXT BE":BL=0:STAY=0
562 GOTO 10
563 FOR BF=1 TO 1000:STEP 1:IF BF=1
564 LET BF="NEXT BF":BL=0:STAY=0
565 GOTO 10
566 FOR BG=1 TO 1000:STEP 1:IF BG=1
567 LET BG="NEXT BG":BL=0:STAY=0
568 GOTO 10
569 FOR BH=1 TO 1000:STEP 1:IF BH=1
570 LET BH="NEXT BH":BL=0:STAY=0
571 GOTO 10
572 FOR BI=1 TO 1000:STEP 1:IF BI=1
573 LET BI="NEXT BI":BL=0:STAY=0
574 GOTO 10
575 FOR BJ=1 TO 1000:STEP 1:IF BJ=1
576 LET BJ="NEXT BJ":BL=0:STAY=0
577 GOTO 10
578 FOR BK=1 TO 1000:STEP 1:IF BK=1
579 LET BK="NEXT BK":BL=0:STAY=0
580 GOTO 10
581 FOR BL=1 TO 1000:STEP 1:IF BL=1
582 LET BL="NEXT BL":BL=0:STAY=0
583 GOTO 10
584 FOR BM=1 TO 1000:STEP 1:IF BM=1
585 LET BM="NEXT BM":BL=0:STAY=0
586 GOTO 10
587 FOR BN=1 TO 1000:STEP 1:IF BN=1
588 LET BN="NEXT BN":BL=0:STAY=0
589 GOTO 10
590 FOR BO=1 TO 1000:STEP 1:IF BO=1
591 LET BO="NEXT BO":BL=0:STAY=0
592 GOTO 10
593 FOR BP=1 TO 1000:STEP 1:IF BP=1
594 LET BP="NEXT BP":BL=0:STAY=0
595 GOTO 10
596 FOR BQ=1 TO 1000:STEP 1:IF BQ=1
597 LET BQ="NEXT BQ":BL=0:STAY=0
598 GOTO 10
599 FOR BR=1 TO 1000:STEP 1:IF BR=1
600 LET BR="NEXT BR":BL=0:STAY=0
601 GOTO 10
602 FOR BS=1 TO 1000:STEP 1:IF BS=1
603 LET BS="NEXT BS":BL=0:STAY=0
604 GOTO 10
605 FOR BT=1 TO 1000:STEP 1:IF BT=1
606 LET BT="NEXT BT":BL=0:STAY=0
607 GOTO 10
608 FOR BU=1 TO 1000:STEP 1:IF BU=1
609 LET BU="NEXT BU":BL=0:STAY=0
610 GOTO 10
611 FOR BV=1 TO 1000:STEP 1:IF BV=1
612 LET BV="NEXT BV":BL=0:STAY=0
613 GOTO 10
614 FOR BU=1 TO 1000:STEP 1:IF BU=1
615 LET BU="NEXT BU":BL=0:STAY=0
616 GOTO 10
617 FOR BV=1 TO 1000:STEP 1:IF BV=1
618 LET BV="NEXT BV":BL=0:STAY=0
619 GOTO 10
620 FOR BW=1 TO 1000:STEP 1:IF BW=1
621 LET BW="NEXT BW":BL=0:STAY=0
622 GOTO 10
623 FOR BX=1 TO 1000:STEP 1:IF BX=1
624 LET BX="NEXT BX":BL=0:STAY=0
625 GOTO 10
626 FOR BY=1 TO 1000:STEP 1:IF BY=1
627 LET BY="NEXT BY":BL=0:STAY=0
628 GOTO 10
629 FOR BZ=1 TO 1000:STEP 1:IF BZ=1
630 LET BZ="NEXT BZ":BL=0:STAY=0
631 GOTO 10
632 FOR CA=1 TO 1000:STEP 1:IF CA=1
633 LET CA="NEXT CA":BL=0:STAY=0
634 GOTO 10
635 FOR CB=1 TO 1000:STEP 1:IF CB=1
636 LET CB="NEXT CB":BL=0:STAY=0
637 GOTO 10
638 FOR CC=1 TO 1000:STEP 1:IF CC=1
639 LET CC="NEXT CC":BL=0:STAY=0
640 GOTO 10
641 FOR CD=1 TO 1000:STEP 1:IF CD=1
642 LET CD="NEXT CD":BL=0:STAY=0
643 GOTO 10
644 FOR CE=1 TO 1000:STEP 1:IF CE=1
645 LET CE="NEXT CE":BL=0:STAY=0
646 GOTO 10
647 FOR CF=1 TO 1000:STEP 1:IF CF=1
648 LET CF="NEXT CF":BL=0:STAY=0
649 GOTO 10
650 FOR CG=1 TO 1000:STEP 1:IF CG=1
651 LET CG="NEXT CG":BL=0:STAY=0
652 GOTO 10
653 FOR CH=1 TO 1000:STEP 1:IF CH=1
654 LET CH="NEXT CH":BL=0:STAY=0
655 GOTO 10
656 FOR CI=1 TO 1000:STEP 1:IF CI=1
657 LET CI="NEXT CI":BL=0:STAY=0
658 GOTO 10
659 FOR CJ=1 TO 1000:STEP 1:IF CJ=1
660 LET CJ="NEXT CJ":BL=0:STAY=0
661 GOTO 10
662 FOR CK=1 TO 1000:STEP 1:IF CK=1
663 LET CK="NEXT CK":BL=0:STAY=0
664 GOTO 10
665 FOR CL=1 TO 1000:STEP 1:IF CL=1
666 LET CL="NEXT CL":BL=0:STAY=0
667 GOTO 10
668 FOR CM=1 TO 1000:STEP 1:IF CM=1
669 LET CM="NEXT CM":BL=0:STAY=0
670 GOTO 10
671 FOR CN=1 TO 1000:STEP 1:IF CN=1
672 LET CN="NEXT CN":BL=0:STAY=0
673 GOTO 10
674 FOR CO=1 TO 1000:STEP 1:IF CO=1
675 LET CO="NEXT CO":BL=0:STAY=0
676 GOTO 10
677 FOR CP=1 TO 1000:STEP 1:IF CP=1
678 LET CP="NEXT CP":BL=0:STAY=0
679 GOTO 10
680 FOR CQ=1 TO 1000:STEP 1:IF CQ=1
681 LET CQ="NEXT CQ":BL=0:STAY=0
682 GOTO 10
683 FOR CR=1 TO 1000:STEP 1:IF CR=1
684 LET CR="NEXT CR":BL=0:STAY=0
685 GOTO 10
686 FOR CS=1 TO 1000:STEP 1:IF CS=1
687 LET CS="NEXT CS":BL=0:STAY=0
688 GOTO 10
689 FOR CT=1 TO 1000:STEP 1:IF CT=1
690 LET CT="NEXT CT":BL=0:STAY=0
691 GOTO 10
692 FOR CU=1 TO 1000:STEP 1:IF CU=1
693 LET CU="NEXT CU":BL=0:STAY=0
694 GOTO 10
695 FOR CV=1 TO 1000:STEP 1:IF CV=1
696 LET CV="NEXT CV":BL=0:STAY=0
697 GOTO 10
698 FOR CW=1 TO 1000:STEP 1:IF CW=1
699 LET CW="NEXT CW":BL=0:STAY=0
700 GOTO 10
701 FOR CX=1 TO 1000:STEP 1:IF CX=1
702 LET CX="NEXT CX":BL=0:STAY=0
703 GOTO 10
704 FOR CY=1 TO 1000:STEP 1:IF CY=1
705 LET CY="NEXT CY":BL=0:STAY=0
706 GOTO 10
707 FOR CZ=1 TO 1000:STEP 1:IF CZ=1
708 LET CZ="NEXT CZ":BL=0:STAY=0
709 GOTO 10
710 FOR DA=1 TO 1000:STEP 1:IF DA=1
711 LET DA="NEXT DA":BL=0:STAY=0
712 GOTO 10
713 FOR DB=1 TO 1000:STEP 1:IF DB=1
714 LET DB="NEXT DB":BL=0:STAY=0
715 GOTO 10
716 FOR DC=1 TO 1000:STEP 1:IF DC=1
717 LET DC="NEXT DC":BL=0:STAY=0
718 GOTO 10
719 FOR DD=1 TO 1000:STEP 1:IF DD=1
720 LET DD="NEXT DD":BL=0:STAY=0
721 GOTO 10
722 FOR DE=1 TO 1000:STEP 1:IF DE=1
723 LET DE="NEXT DE":BL=0:STAY=0
724 GOTO 10
725 FOR DF=1 TO 1000:STEP 1:IF DF=1
726 LET DF="NEXT DF":BL=0:STAY=0
727 GOTO 10
728 FOR DG=1 TO 1000:STEP 1:IF DG=1
729 LET DG="NEXT DG":BL=0:STAY=0
730 GOTO 10
731 FOR DH=1 TO 1000:STEP 1:IF DH=1
732 LET DH="NEXT DH":BL=0:STAY=0
733 GOTO 10
734 FOR DI=1 TO 1000:STEP 1:IF DI=1
735 LET DI="NEXT DI":BL=0:STAY=0
736 GOTO 10
735 FOR DJ=1 TO 1000:STEP 1:IF DJ=1
737 LET DJ="NEXT DJ":BL=0:STAY=0
738 GOTO 10
736 FOR DK=1 TO 1000:STEP 1:IF DK=1
739 LET DK="NEXT DK":BL=0:STAY=0
740 GOTO 10
737 FOR DL=1 TO 1000:STEP 1:IF DL=1
741 LET DL="NEXT DL":BL=0:STAY=0
742 GOTO 10
738 FOR DM=1 TO 1000:STEP 1:IF DM=1
743 LET DM="NEXT DM":BL=0:STAY=0
744 GOTO 10
739 FOR DN=1 TO 1000:STEP 1:IF DN=1
745 LET DN="NEXT DN":BL=0:STAY=0
746 GOTO 10
740 FOR DO=1 TO 1000:STEP 1:IF DO=1
747 LET DO="NEXT DO":BL=0:STAY=0
748 GOTO 10
741 FOR DP=1 TO 1000:STEP 1:IF DP=1
749 LET DP="NEXT DP":BL=0:STAY=0
750 GOTO 10
742 FOR DQ=1 TO 1000:STEP 1:IF DQ=1
751 LET DQ="NEXT DQ":BL=0:STAY=0
752 GOTO 10
743 FOR DR=1 TO 1000:STEP 1:IF DR=1
753 LET DR="NEXT DR":BL=0:STAY=0
754 GOTO 10
744 FOR DS=1 TO 1000:STEP 1:IF DS=1
755 LET DS="NEXT DS":BL=0:STAY=0
756 GOTO 10
745 FOR DT=1 TO 1000:STEP 1:IF DT=1
757 LET DT="NEXT DT":BL=0:STAY=0
758 GOTO 10
746 FOR DU=1 TO 1000:STEP 1:IF DU=1
759 LET DU="NEXT DU":BL=0:STAY=0
760 GOTO 10
747 FOR DV=1 TO 1000:STEP 1:IF DV=1
761 LET DV="NEXT DV":BL=0:STAY=0
762 GOTO 10
748 FOR DW=1 TO 1000:STEP 1:IF DW=1
763 LET DW="NEXT DW":BL=0:STAY=0
764 GOTO 10
749 FOR DX=1 TO 1000:STEP 1:IF DX=1
765 LET DX="NEXT DX":BL=0:STAY=0
766 GOTO 10
750 FOR DY=1 TO 1000:STEP 1:IF DY=1
767 LET DY="NEXT DY":BL=0:STAY=0
768 GOTO 10
751 FOR DZ=1 TO 1000:STEP 1:IF DZ=1
769 LET DZ="NEXT DZ":BL=0:STAY=0
770 GOTO 10
752 FOR EA=1 TO 1000:STEP 1:IF EA=1
771 LET EA="NEXT EA":BL=0:STAY=0
772 GOTO 10
753 FOR EB=1 TO 1000:STEP 1:IF EB=1
773 LET EB="NEXT EB":BL=0:STAY=0
774 GOTO 10
754 FOR EC=1 TO 1000:STEP 1:IF EC=1
775 LET EC="NEXT EC":BL=0:STAY=0
776 GOTO 10
755 FOR ED=1 TO 1000:STEP 1:IF ED=1
777 LET ED="NEXT ED":BL=0:STAY=0
778 GOTO 10
756 FOR EE=1 TO 1000:STEP 1:IF EE=1
779 LET EE="NEXT EE":BL=0:STAY=0
780 GOTO 10
757 FOR EF=1 TO 1000:STEP 1:IF EF=1
781 LET EF="NEXT EF":BL=0:STAY=0
782 GOTO 10
758 FOR EF=1 TO 1000:STEP 1:IF EF=1
783 LET EF="NEXT EF":BL=0:STAY=0
784 GOTO 10
759 FOR EG=1 TO 1000:STEP 1:IF EG=1
785 LET EG="NEXT EG":BL=0:STAY=0
786 GOTO 10
760 FOR EH=1 TO 1000:STEP 1:IF EH=1
787 LET EH="NEXT EH":BL=0:STAY=0
788 GOTO 10
761 FOR EI=1 TO 1000:STEP 1:IF EI=1
789 LET EI="NEXT EI":BL=0:STAY=0
790 GOTO 10
762 FOR EJ=1 TO 1000:STEP 1:IF EJ=1
791 LET EJ="NEXT EJ":BL=0:STAY=0
792 GOTO 10
763 FOR EK=1 TO 1000:STEP 1:IF EK=1
793 LET EK="NEXT EK":BL=0:STAY=0
794 GOTO 10
764 FOR EL=1 TO 1000:STEP 1:IF EL=1
795 LET EL="NEXT EL":BL=0:STAY=0
796 GOTO 10
765 FOR EM=1 TO 1000:STEP 1:IF EM=1
797 LET EM="NEXT EM":BL=0:STAY=0
798 GOTO 10
766 FOR EN=1 TO 1000:STEP 1:IF EN=1
799 LET EN="NEXT EN":BL=0:STAY=0
800 GOTO 10
767 FOR EO=1 TO 1000:STEP 1:IF EO=1
801 LET EO="NEXT EO":BL=0:STAY=0
802 GOTO 10
768 FOR EP=1 TO 1000:STEP 1:IF EP=1
803 LET EP="NEXT EP":BL=0:STAY=0
804 GOTO 10
769 FOR EQ=1 TO 1000:STEP 1:IF EQ=1
805 LET EQ="NEXT EQ":BL=0:STAY=0
806 GOTO 10
770 FOR ER=1 TO 1000:STEP 1:IF ER=1
807 LET ER="NEXT ER":BL=0:STAY=0
808 GOTO 10
771 FOR ES=1 TO 1000:STEP 1:IF ES=1
809 LET ES="NEXT ES":BL=0:STAY=0
810 GOTO 10
772 FOR ET=1 TO 1000:STEP 1:IF ET=1
811 LET ET="NEXT ET":BL=0:STAY=0
812 GOTO 10
773 FOR EU=1 TO 1000:STEP 1:IF EU=1
813 LET EU="NEXT EU":BL=0:STAY=0
814 GOTO 10
774 FOR EV=1 TO 1000:STEP 1:IF EV=1
815 LET EV="NEXT EV":BL=0:STAY=0
816 GOTO 10
775 FOR EW=1 TO 1000:STEP 1:IF EW=1
817 LET EW="NEXT EW":BL=0:STAY=0
818 GOTO 10
776 FOR EX=1 TO 1000:STEP 1:IF EX=1
819 LET EX="NEXT EX":BL=0:STAY=0
820 GOTO 10
777 FOR EY=1 TO 1000:STEP 1:IF EY=1
821 LET EY="NEXT EY":BL=0:STAY=0
822 GOTO 10
778 FOR EZ=1 TO 1000:STEP 1:IF EZ=1
823 LET EZ="NEXT EZ":BL=0:STAY=0
824 GOTO 10
779 FOR FA=1 TO 1000:STEP 1:IF FA=1
825 LET FA="NEXT FA":BL=0:STAY=0
826 GOTO 10
780 FOR FB=1 TO 1000:STEP 1:IF FB=1
827 LET FB="NEXT FB":BL=0:STAY=0
828 GOTO 10
781 FOR FC=1 TO 1000:STEP 1:IF FC=1
829 LET FC="NEXT FC":BL=0:STAY=0
830 GOTO 10
782 FOR FD=1 TO 1000:STEP 1:IF FD=1
831 LET FD="NEXT FD":BL=0:STAY=0
832 GOTO 10
783 FOR FE=1 TO 1000:STEP 1:IF FE=1
833 LET FE="NEXT FE":BL=0:STAY=0
834 GOTO 10
784 FOR FF=1 TO 1000:STEP 1:IF FF=1
835 LET FF="NEXT FF":BL=0:STAY=0
836 GOTO 10
785 FOR FG=1 TO 1000:STEP 1:IF FG=1
837 LET FG="NEXT FG":BL=0:STAY=0
838 GOTO 10
786 FOR FH=1 TO 1000:STEP 1:IF FH=1
839 LET FH="NEXT FH":BL=0:STAY=0
840 GOTO 10
787 FOR FI=1 TO 1000:STEP 1:IF FI=1
841 LET FI="NEXT FI":BL=0:STAY=0
842 GOTO 10
788 FOR FJ=1 TO 1000:STEP 1:IF FJ=1
843 LET FJ="NEXT FJ":BL=0:STAY=0
844 GOTO 10
789 FOR FK=1 TO 1000:STEP 1:IF FK=1
845 LET FK="NEXT FK":BL=0:STAY=0
846 GOTO 10
790 FOR FL=1 TO 1000:STEP 1:IF FL=1
847 LET FL="NEXT FL":BL=0:STAY=0
848 GOTO 10
791 FOR FM=1 TO 1000:STEP 1:IF FM=1
849 LET FM="NEXT FM":BL=0:STAY=0
850 GOTO 10
792 FOR FN=1 TO 1000:STEP 1:IF FN=1
851 LET FN="NEXT FN":BL=0:STAY=0
852 GOTO 10
793 FOR FO=1 TO 1000:STEP 1:IF FO=1
853 LET FO="NEXT FO":BL=0:STAY=0
854 GOTO 10
794 FOR FP=1 TO 1000:STEP 1:IF FP=1
855 LET FP="NEXT FP":BL=0:STAY=0
856 GOTO 10
795 FOR FQ=1 TO 1000:STEP 1:IF FQ=1
857 LET FQ="NEXT FQ":BL=0:STAY=0
858 GOTO 10
796 FOR FR=1 TO 1000:STEP 1:IF FR=1
859 LET FR="NEXT FR":BL=0:STAY=0
860 GOTO 10
797 FOR FS=1 TO 1000:STEP 1:IF FS=1
861 LET FS="NEXT FS":BL=0:STAY=0
862 GOTO 10
798 FOR FT=1 TO 1000:STEP 1:IF FT=1
863 LET FT="NEXT FT":BL=0:STAY=0
864 GOTO 10
799 FOR FU=1 TO 1000:STEP 1:IF FU=1
865 LET FU="NEXT FU":BL=0:STAY=0
866 GOTO 10
800 FOR FV=1 TO 1000:STEP 1:IF FV=1
867 LET FV="NEXT FV":BL=0:STAY=0
868 GOTO 10
801 FOR FW=1 TO 1000:STEP 1:IF FW=1
869 LET FW="NEXT FW":BL=0:STAY=0
870 GOTO 10
802 FOR FX=1 TO 1000:STEP 1:IF FX=1
871 LET FX="NEXT FX":BL=0:STAY=0
872 GOTO 10
803 FOR FY=1 TO 1000:STEP 1:IF FY=1
873 LET FY="NEXT FY":BL=0:STAY=0
874 GOTO 10
804 FOR FZ=1 TO 1000:STEP 1:IF FZ=1
875 LET FZ="NEXT FZ":BL=0:STAY=0
876 GOTO 10
805 FOR GA=1 TO 1000:STEP 1:IF GA=1
877 LET GA="NEXT GA":BL=0:STAY=0
878 GOTO 10
806 FOR GB=1 TO 1000:STEP 1:IF GB=1
879 LET GB="NEXT GB":BL=0:STAY=0
880 GOTO 10
807 FOR GC=1 TO 1000:STEP 1:IF GC=1
881 LET GC="NEXT GC":BL=0:STAY=0
882 GOTO 10
808 FOR GD=1 TO 1000:STEP 1:IF GD=1
883 LET GD="NEXT GD":BL=0:STAY=0
884 GOTO 10
809 FOR GE=1 TO 1000:STEP 1:IF GE=1
885 LET GE="NEXT GE":BL=0:STAY=0
886 GOTO 10
810 FOR GF=1 TO 1000:STEP 1:IF GF=1
887 LET GF="NEXT GF":BL=0:STAY=0
888 GOTO 10
811 FOR GG=1 TO 1000:STEP 1:IF GG=1
889 LET GG="NEXT GG":BL=0:STAY=0
890 GOTO 10
812 FOR GH=1 TO 1000:STEP 1:IF GH=1
891 LET GH="NEXT GH":BL=0:STAY=0
892 GOTO 10
813 FOR GI=1 TO 1000:STEP 1:IF GI=1
893 LET GI="NEXT GI":BL=0:STAY=0
894 GOTO 10
814 FOR GJ=1 TO 1000:STEP 1:IF GJ=1
895 LET GJ="NEXT GJ":BL=0:STAY=0
896 GOTO 10
815 FOR GK=1 TO 1000:STEP 1:IF GK=1
897 LET GK="NEXT GK":BL=0:STAY=0
898 GOTO 10
816 FOR GL=1 TO 1000:STEP 1:IF GL=1
899 LET GL="NEXT GL":BL=0:STAY=0
900 GOTO 10
817 FOR GM=1 TO 1000:STEP 1:IF GM=1
901 LET GM="NEXT GM":BL=0:STAY=0
902 GOTO 10
818 FOR GN=1 TO 1000:STEP 1:IF GN=1
903 LET GN="NEXT GN":BL=0:STAY=0
904 GOTO 10
819 FOR GO=1 TO 1000:STEP 1:IF GO=1
905 LET GO="NEXT GO":BL=0:STAY=0
906 GOTO 10
820 FOR GP=1 TO 1000:STEP 1:IF GP=1
907 LET GP="NEXT GP":BL=0:STAY=0
908 GOTO 10
821 FOR GQ=1 TO 1000:STEP 1:IF GQ=1
909 LET GQ="NEXT GQ":BL=0:STAY=0
910 GOTO 10
822 FOR GR=1 TO 1000:STEP 1:IF GR=1
911 LET GR="NEXT GR":BL=0:STAY=0
912 GOTO 10
823 FOR GS=1 TO 1000:STEP 1:IF GS=1
913 LET GS="NEXT GS":BL=0:STAY=0
914 GOTO 10
824 FOR GT=1 TO 1000:STEP 1:IF GT=1
915 LET GT="NEXT GT":BL=0:STAY=0
916 GOTO 10
825 FOR GU=1 TO 1000:STEP 1:IF GU=1
917 LET GU="NEXT GU":BL=0:STAY=0
918 GOTO 10
826 FOR GV=1 TO 1000:STEP 1:IF GV=1
919 LET GV="NEXT GV":BL=0:STAY=0
920 GOTO 10
827 FOR GW=1 TO 1000:STEP 1:IF GW=1
921 LET GW="NEXT GW":BL=0:STAY=0
922 GOTO 10
828 FOR GX=1 TO 1000:STEP 1:IF GX=1
923 LET GX="NEXT GX":BL=0:STAY=0
924 GOTO 10
829 FOR GY=1 TO 1000:STEP 1:IF GY=1
925 LET GY="NEXT GY":BL=0:STAY=0
926 GOTO 10
830 FOR GZ=1 TO 1000:STEP 1:IF GZ=1
927 LET GZ="NEXT GZ":BL=0:STAY=0
928 GOTO 10
831 FOR HA=1 TO 1000:STEP 1:IF HA=1
929 LET HA="NEXT HA":BL=0:STAY=0
930 GOTO 10
832 FOR HB=1 TO 1000:STEP 1:IF HB=1
931 LET HB="NEXT HB":BL=0:STAY=0
932 GOTO 10
833 FOR HC=1 TO 1000:STEP 1:IF HC=1
933 LET HC="NEXT HC":BL=0:STAY=0
934 GOTO 10
834 FOR HD=1 TO 1000:STEP 1:IF HD=1
935 LET HD="NEXT HD":BL=0:STAY=0
936 GOTO 10
835 FOR HE=1 TO 1000:STEP 1:IF HE=1
937 LET HE="NEXT HE":BL=0:STAY=0
938 GOTO 10
836 FOR HF=1 TO 1000:STEP 1:IF HF=1
939 LET HF="NEXT HF":BL=0:STAY=0
940 GOTO 10
837 FOR HG=1 TO 1000:STEP 1:IF HG=1
941 LET HG="NEXT HG":BL=0:STAY=0
942 GOTO 10
838 FOR HH=1 TO 1000:STEP 1:IF HH=1
943 LET HH="NEXT HH":BL=0:STAY=0
944 GOTO 10
839 FOR HI=1 TO 1000:STEP 1:IF HI=1
945 LET HI="NEXT HI":BL=0:STAY=0
946 GOTO 10
840 FOR HJ=1 TO 1000:STEP 1:IF HJ=1
947 LET HJ="NEXT HJ":BL=0:STAY=0
948 GOTO 10
841 FOR HK=1 TO 1000:STEP 1:IF HK=1
949 LET HK="NEXT HK":BL=0:STAY=0
950 GOTO 10
842 FOR HL=1 TO 1000:STEP 1:IF HL=1
951 LET HL="NEXT HL":BL=0:STAY=0
952 GOTO 10
843 FOR HM=1 TO 1000:STEP 1:IF HM=1
953 LET HM="NEXT HM":BL=0:STAY=0
954 GOTO 10
844 FOR HN=1 TO 1000:STEP 1:IF HN=1
955 LET HN="NEXT HN":BL=0:STAY=0
956 GOTO 10
845 FOR HO=1 TO 1000:STEP 1:IF HO=1
957 LET HO="NEXT HO":BL=0:STAY=0
958 GOTO 10
846 FOR HP=1 TO 1000:STEP 1:IF HP=1
959 LET HP="NEXT HP":BL=0:STAY=0
960 GOTO 10
847 FOR HQ=1 TO 1000:STEP 1:IF HQ=1
961 LET HQ="NEXT HQ":BL=0:STAY=0
962 GOTO 10
848 FOR HR=1 TO 1000:STEP 1:IF HR=1
963 LET HR="NEXT HR":BL=0:STAY=0
964 GOTO 10
849 FOR HS=1 TO 1000:STEP 1:IF HS=1
965 LET HS="NEXT HS":BL=0:STAY=0
966 GOTO 10
850 FOR HT=1 TO 1000:STEP 1:IF HT=1
967 LET HT="NEXT HT":BL=0:STAY=0
968 GOTO 10
851 FOR HU=1 TO 1000:STEP 1:IF HU=1
969 LET HU="NEXT HU":BL=0:STAY=0
970 GOTO 10
852 FOR HV=1 TO 1000:STEP 1:IF HV=1
971 LET HV="NEXT HV":BL=0:STAY=0
972 GOTO 10
853 FOR HW=1 TO 1000:STEP 1:IF HW=1
973 LET HW="NEXT HW":BL=0:STAY=0
974 GOTO 10
854 FOR HX=1 TO 1000:STEP 1:IF HX=1
975 LET H
```


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Francis Jago goes deep into
the insides of the
Commodore Amiga.

AMIGA

Whenever the word 'Amiga' is mentioned, someone will have something to say about Commodore's wonder-baby. At first all that was said was how wonderful this machine was, and how it would take the world by storm; gradually, however, people saw the Amiga 1000, at less than half the price — and started wondering.

I have owned an Amiga for nearly six months now, and in that time I think it is safe to say that I have formed a very personal view about a machine which, if used to its potential, can really show the true power of a personal computer.

What makes the Amiga so different from all the other personal computers is its sheer versatility. Being a true multi-tasking machine means that it can do almost as many things as you want simultaneously, enabling you to jump from one task to another with the knowledge that all the other tasks will continue.

Hardware

To successfully explain the Amiga you must really split the hardware into different sections: specification, workbench, graphics, sound, and peripherals. Although this cannot cover everything to do with the Amiga, it should give you a valuable insight into this machine.

Specification

The specification given here is of the American Amiga, when launched in Europe it will probably come with two disk drives and 1020k as standard.

Basically the components of the Amiga are:

- Motorola MC 68000 16/32 bit main processor.

- 256k bytes of internal RAM, expandable to 512k.

- 256k bytes of ROM containing a real-time, multi-tasking, operating system with sound, graphics and animation routines. Built in 3½" double sided disk drive. Expansion port for up to 3 external disk drives with either 3½" or 5¼" double sided.

- Fully programmable serial port.

- Fully programmable parallel port.

- Two button mechanical mouse.

- Two 9 pin D type control ports.

- Detached 48-key keyboard with numeric keypad, 16 function keys and cursor section.

- Ports for analog or digital RGB output, as well as composite video.



Left and right stereo audio output ports. Expansion connector that allows you to add RAM, hard disks, or other peripherals.

Workbench

At present, to start up an Amiga system, you must first insert a disk that loads the operating system into write-protected RAM. Although this does take time, it means that in the future, when new versions are released, you will not have to mess about switching chips around. Having done this you will be requested to insert what is called a 'workbench' disk. This is the program that makes the Amiga so easy to use, and enables a complete beginner to start harnessing the machine's power.

Once in the Workbench, most people will immediately recognise the Macintosh-esque windows and icons. However this time they are in colour! Workbench is provided for two real reasons; firstly it lets you control the



computer's functions via a mouse, and secondly it lets each individual user customise his Amiga. Using a program called Preferences, you can choose the colour of text, the colour of the background, how sensitive you want the mouse to be, and also redefine the cursor which indicates the mouse position. On the more technical side, Preferences allows you to set baud rates, and redefine the bit images required for your printer.

The Workbench screen, when operated, displays one large window, within which are a variety of icons. On selecting a disk with the mouse, a new window will appear, giving you another selection of icons to choose from. Icons can best be described as small pictures which appear on the screen representing tools, projects, disks, drives and the Trashcan. Windows let you see the contents of projects, drives, disks, and the Trashcan. Windows can be altered both in size and position.

On the current version of the Workbench disk (v1.3) there are four drives — Desktop, Utilities, System and

the detailed story



Empty. Demos are three different programs which show well how efficient a multi-tasker, the Amiga really is. Utilities gives you an on-screen calculator and notepad, a file manager, and System produces a disk copier. The Empty demo allows you to create a personal file for the Workbench disk.

To make the most of the system, it is preferable to create four own Workbench disks to suit the type of application you will be running. I, for instance, would rather use the keyboard than the mouse, and have my Workbench set up accordingly.

Graphics

If one feature makes the Amiga stand out in a crowd more than any other it has to be the graphics. What makes this, and the sound, so outstanding are the three dedicated chips designed by Jay Miner, founder of Amiga. These chips, affectionately called AGAUX, DEMUX, and PAULA, effectively allow the main CPU to do other things while they take on

specific roles, such as controlling graphics and sound.

In short terms, the Amiga has four resolutions: 320 x 256, 320 x 400, 640 x 256, and 640 x 400. However, the two modes that involve the use of 400 vertical pixels are more difficult to control as it requires a special feature called interlacing. This allows the programmer to utilize the unused spaces to double the vertical resolution.

In each different mode you also have different amounts of available colours. In total the Amiga has a palette of 4096 colours, and in low-resolution you can put up to 32 different colours on-screen at once. However, the higher resolution modes have correspondingly less available colours. One clever trick that can be used in certain situations however is called HAM (Half And Modified). This method allows all 4096 colours to be displayed on screen simultaneously, while only sacrificing 48K. By producing this quality of colour resolution you can produce pictures of a standard as yet unsurpassed on a personal computer.

One word that will be recognizable to almost all of you is sprites. The Amiga can cope with up to eight sprites on screen at once, each of which can be as tall as is required, although only 16 pixels across. For animation purposes the Amiga also has something called a Blitter (Block Image Transfer), and although this is by no means limited to graphics, it can be used to move large amounts of graphic data around the screen at amazing speeds, creating some outstanding effects.

It is features such as the colour palette, as well as the blitter, that make it obvious what potential the Amiga has as a graphics machine.

Sound

To complement the Amiga's graphics, it comes with a dazzling potential for sound generation. Controlled by the Paula chip, it can produce stereo output through the left and right external sockets, and without too much difficulty, can produce sounds to rival some more expensive synthesizers.

The Amiga provides the user with four separate sound channels, each of which can be used to carry a wide range of sounds, they do not have to be monophonic. By using digital sounds and envelopes, the Amiga is quite capable of producing sounds which have been sampled, and then converted to the correct format, only to reproduce them perfectly later.

As well as producing excellent quality sound, the standard Amiga can produce quite breathtaking speech, simply by using simple commands, thus rendering software packages are no longer a thing of the past!

Peripherals

If you want a machine that will grow as a system, then the Amiga certainly has the potential. With its plethora of ports (11 it should be possible to interface almost anything to this machine, with the right software.

Printers are well provided for in the Preferences program, with most popular makes such as Epson, Diablo, Commodore, and others all having software already written to take advantage of the graphics.

Modems too are easy to rig up, with a totally programmable serial port, it should just be a question of plug-in and go. I am currently running a 1200 baud modem with no troubles.

Conclusion

Although I have only managed to touch the surface of what the Amiga is really capable of, it is clear to me that, if it is marketed properly, this machine could succeed by creating a market, rather than being in as a run of the mill PC, that would be a real shame!

Gareth Thomas brings you your own type-in F&A Database.

Abstract

MANAGEMENT IS A COMPLETE database creation and management system for the C64. It consists of a suite of three programs; the first program is mainly a machine code loader that it also carries out 'once only' operations such as writing up the SID and VIC chips etc. for the main programs, and then auto-runs the management programs. The management program consists of shell-matrix sorting routines, a very powerful data search and edit system and a unique data access method for tape and disk. The third program is the format program, this allows the user to design a complete screen layout for the input of data using any of the available colours, no video, graphics characters, and even the full-screen editing facilities of the 64. Then by using a sprite cursor and an overlaid pop-up menu, it defines the parameters affecting each of the fields i.e. length, datatype, input, position, and name.

The *mc* is placed above *Risc* to the 4K block at 34,000 from *MC0A1* to *MC0A5*, by taking two *Risc* memory. The *mc* is swapped between the stored screen definition which is split into two; the screen memory from *MC000* and the colour memory from *MC005*, using *mc*'s routines the screen can be stored and recalled instantly for updating the file. Being stored in this block means that over 20.5K is free for data. This is allocated to 200 records of up to nine fields each is over being, allowed a maximum length of 200 characters (this number of records could easily be altered up to two or three times more and although the maximum field length is 255 this would probably never be used and is set at this to impose no constraints on the user. Since string storage is dynamic, the field length could be set to this and it would not immediately be allowed 255 bytes. Details on how to extend the program will be given later in the documentation).

The reader will start to

7. Interrupted driven reaction
[H₂A] = 0.0010 M; [H₂O₂] = 0.0010 M

DATA BASE 64

Basic input routines and use the full cursor editing. This has three purposes: to stop the cursor scrolling the screen by displaying it as rows in the top and bottom lines; deactivate the redex and exons keys while allowing their shifted, controlled and CBA4 functions to be registered; allows the INPUT routine to be exited by pressing function keys as well as RETURN.

2. **Input routine (SCAAB - SCBAH):** This routine simulates the basic input routine but improves on it by adding: the ability to preset the maximum number of characters to be entered, allowing only certain data to be entered which can be preset and can be of four types - alphanumeric, digit, numeric, or for any other numeric data being entered; it is possible to specify a particular amount (i.e. less than, greater than, or between,

1. **Cursor.A1(H:BM - SCB72):** This simulates the POINT A1 command found in many other Blacs. It uses the kernel FLOW routine at \$1190 and a few Blacs SCB4 calls to allow parameter passing of the type and column positions from the SCB call.

4. **Screen software (SCB7) - SCB8** This stores a copy of the screen layout defined by the format program (except for the top and bottom rows). It spans the screen memory at \$C005, the colour memory at \$C006.

1. Screen recall (SCRM) - 100000: This recalls a copy of the screen stored by the system above.

If you wish to use the system as disk then the three programs must be saved under the filenames `MPH.A5/C`, `MPH.A5/M` and `MPH.A5/FORM` in order to maintain the compatibility with the routines used in the main (and format) programs. Also certain lines need to be altered in the machine code loader so that the main program is auto-run correctly. This is shown below:

Type in the following lines, with the m/c leader in memory:

Age Group	Percentage
18-24	~10
25-34	~25
35-44	~45
45-54	~65
55-64	~85
65+	~95

```

0 REMOSPCONFIGURE:*****
10 REM  BLKPC100 DRP L&M
   BLKPC100
20 REM  BLKPC100L1-000PC10
30 REM  L 100 BLTH000
   L
40 REM  L&M L&M*****
50 L
60 REM  LOCK INTO CHARACTER
   SET 3
70 PRINT CHR$(10)CHR$(10)
80 REM  BLACK SCREEN
90 POKE 32768,1:POKE 32769,0
   GOTO 1
100 PRINT"*****TABLIZI"
   [WHITE,REDON,POWER]
   LOADING DATA
110 R=0.1774/LM=0000
120 REM  1:17 0.1754 THEN POKE
   L 32768,0:POKE 32769,0
130 IF T=0 THEN T=0:LM=L+0.1
   GOTO 140
140 IF R=PM THEN L=L
150 PRINT TAB(10)"*****"
   SCREEN 1:LINE=100
160 POKE 32768,128:POKE 32769,0
   R=0.00248
200 REM  SET OF SET AND PCE
   CHIPS
210 FOR L=0 TO 32+24
   POKE L,0:NEXT
220 POKE 32+24,15
230 POKE 32+0,14:POKE 32+14,14
240 POKE 32+0,14:POKE 32+1,2
250 POKE 32+16,3:POKE 32+1,3
260 POKE 32+0,14:POKE 32+14,14
270 POKE 32+1,14:POKE 32+1,14
280 POKE 32+0,14
290 REM  AUTO-RUN MAIN PROGRAM
310 POKE 321,121:POKE 370,1
   END

```

11

3000 DATA 145,303,170,175,
142,1,204,1,340,9,128,1440
3010 DATA 200,45,140,34,200,
40,340,30,128,200,2417

2020 247W 21, 240, 42, 202, 4,
140, 8, 201, 2, 240, 1122
2020 247W 4, 202, 4, 202, 4, 112,
254, 149, 1, 132, 202
2040 247W 262, 76, 71, 232, 142,
114, 202, 136, 3, 142
2080 247W 149, 2, 121, 214, 3,
71, 232, 141, 23, 206, 122
2040 247W 149, 149, 22, 121, 114,
14, 72, 212, 149, 127, 146
2070 247W 141, 202, 14, 124,
149, 47, 141, 142, 2, 149
2080 247W 149, 202, 141, 144, 2,
88, 14, 124, 149, 73, 142
2070 247W 141, 142, 13, 149, 122,
141, 149, 13, 142
2100 247W 149, 142, 13, 202, 122,
12, 232, 202, 149, 202, 1, 142
2110 247W 179, 76, 242, 202, 142,
232, 147, 122, 204, 141, 202
2120 247W 232, 211, 149, 147, 20,
214, 232, 120, 21, 219, 1494
2120 247W 232, 149, 142, 21, 219,
232, 120, 76, 121, 204, 1271
2140 247W 201, 122, 204, 249,
201, 134, 240, 242, 201, 122,
249
2150 247W 240, 141, 201, 12, 240,
227, 201, 30, 240, 21, 142
2160 247W 142, 201, 240, 147, 147,
179, 201, 179, 201, 147, 20,
240

2170 0478 12, 23, 25, 26, 145, 24,
32, 23, 25, 7, 30, 181, 100

2180 0478 200, 201, 1, 40, 174,
204, 92, 14, 175, 145, 1200

2190 0478 250, 261, 1, 200, 14,
158, 264, 12, 240, 170, 1440

2200 0478 260, 261, 40, 137, 20,
91, 10, 150, 76, 182, 110

2210 0478 280, 294, 5, 260, 55,
120, 204, 40, 240, 14, 140

2220 0478 291, 47, 200, 184, 201,
42, 140, 142, 201, 45, 1050

2230 0478 340, 150, 120, 250, 40,
340, 120, 201, 40, 40, 1420

2240 0478 14, 204, 14, 18, 74,
182, 200, 201, 5, 940

2250 0478 340, 250, 34, 180, 140,

100

displayed. If we take the example of the club membership system, then the display might look something like this:

Club Membership System
Name -
Address -
Tel. no -
Membership no. -

Then, to define the input position for 'Name', you might move the cursor to the column next to the dash after 'Name' and then move the position by pressing RETURN.

After the input position has been set on configured menu will come down if you've just typed the program in it's not a bug. This is where you select the type of data the field will hold, there are four types: alphabetic, numeric, digit and any. These options are on the menu plus another five. The extra ones are used to limit the values of data entered and all conform to the rules for 'DAGIT' data:

- 1 ALPHABETIC - alphabetic characters only
- 2 NUMERIC - 0 to 9 plus +, -, / and point
- 3 DIGIT - 0 to 9 only
- 4 ANYTHING - any keyboard character
- 5 BETWEEN - between but NOT equal to two numbers
- 6 < than
- 7 > than
- 8 < than or = to
- 9 > than or = to

To select datatype move the blue cursor with the up/down cursor key to the required type and press RETURN. If you select any datatype other but then you will be asked to input the relevant values, which must be conformant to, in the window at the bottom of the menu. If you have made a mistake in selecting the input position, pressing T will return back to this part without updating the field pointer to the next field, so that you may re-define.

The third parameter to define is the length. After the datatype menu has disappeared, a cross cursor will appear next to the position you defined for the input, with a reverse-video representation of the field number in the exact location. Holding down any key will move the cursor which will leave a trail of dots behind it, each representing one

```

1400 GET 04:07 04:08 THEN 14
1401
1402 IF 04:07 THEN 1403
1403 GOSUB 10000 IF P<"C" THEN
  0:GOTO 1404
1404 CLOSE 1:CLOSE 1:RETURN
1405 NEW SCREEN OLD FILE
1406 PRINT#, "04:07"
1407 CLOSE 1:CLOSE 1:RETURN
1408
1409 NEW SAVE FILES
1410 NEW SET DATATYPE
1411 GOSUB 10000 PRINT "10000",
  10000:GOTO 04:07 OR 04:07
1412 GET 04:07 04:08 THEN 14
  30
1413 IF 04:07 THEN 1403
1414 NEW 04:07 FORMAT
1415 PRINT#, "14:07", "T"
1416 FOR 04:07 TO 1
  1417 04:07 TO 1
  1418 IF 04:07 THEN 04:07,
    04:07
1419 PRINT#, "14:07", "10000"
1420
1421 NEW 04:07 SCREEN LAYOUT
1422 04:07:04:07:04:07:04:07
1423 1424 1425 1426 1427
  1428 PRINT#, "04:07:04:07:04:07"
  1429 1430 1431 1432
1433 NEW 04:07 DATA
1434 PRINT#, "14:07", "10000", "14:07"
1435 FOR 04:07 TO 14:07
  1436 04:07 TO 14:07
  1437 PRINT#, "14:07", "10000"
  1438 CLOSE 1:RETURN
1439
1440 NEW INPUT FILES
1441 1442 IF 04:07 THEN 1443
1443 NEW SAVE FORMAT
1444 INPUT#, "14:07", "10000", "14:07"
1445 IF 04:07 THEN PRINT
  10000:10000:10000:10000
  TYPE 10000:10000
  1446 1447 1448 1449 1450 1451 1452 1453 1454 1455 1456 1457 1458 1459 1460 1461 1462 1463 1464 1465 1466 1467 1468 1469 1470 1471 1472 1473 1474 1475 1476 1477 1478 1479 1480 1481 1482 1483 1484 1485 1486 1487 1488 1489 1490 1491 1492 1493 1494 1495 1496 1497 1498 1499 1500 1501 1502 1503 1504 1505 1506 1507 1508 1509 1510 1511 1512 1513 1514 1515 1516 1517 1518 1519 1520 1521 1522 1523 1524 1525 1526 1527 1528 1529 1530 1531 1532 1533 1534 1535 1536 1537 1538 1539 1540 1541 1542 1543 1544 1545 1546 1547 1548 1549 1550 1551 1552 1553 1554 1555 1556 1557 1558 1559 1560 1561 1562 1563 1564 1565 1566 1567 1568 1569 1570 1571 1572 1573 1574 1575 1576 1577 1578 1579 1580 1581 1582 1583 1584 1585 1586 1587 1588 1589 1590 1591 1592 1593 1594 1595 1596 1597 1598 1599 1600 1601 1602 1603 1604 1605 1606 1607 1608 1609 1610 1611 1612 1613 1614 1615 1616 1617 1618 1619 1620 1621 1622 1623 1624 1625 1626 1627 1628 1629 1630 1631 1632 1633 1634 1635 1636 1637 1638 1639 1640 1641 1642 1643 1644 1645 1646 1647 1648 1649 1650 1651 1652 1653 1654 1655 1656 1657 1658 1659 1660 1661 1662 1663 1664 1665 1666 1667 1668 1669 1670 1671 1672 1673 1674 1675 1676 1677 1678 1679 1680 1681 1682 1683 1684 1685 1686 1687 1688 1689 1690 1691 1692 1693 1694 1695 1696 1697 1698 1699 1700 1701 1702 1703 1704 1705 1706 1707 1708 1709 1710 1711 1712 1713 1714 1715 1716 1717 1718 1719 1720 1721 1722 1723 1724 1725 1726 1727 1728 1729 1730 1731 1732 1733 1734 1735 1736 1737 1738 1739 1740 1741 1742 1743 1744 1745 1746 1747 1748 1749 1750 1751 1752 1753 1754 1755 1756 1757 1758 1759 1760 1761 1762 1763 1764 1765 1766 1767 1768 1769 1770 1771 1772 1773 1774 1775 1776 1777 1778 1779 1780 1781 1782 1783 1784 1785 1786 1787 1788 1789 1790 1791 1792 1793 1794 1795 1796 1797 1798 1799 1800 1801 1802 1803 1804 1805 1806 1807 1808 1809 1810 1811 1812 1813 1814 1815 1816 1817 1818 1819 1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833 1834 1835 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845 1846 1847 1848 1849 1850 1851 1852 1853 1854 1855 1856 1857 1858 1859 1860 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
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**Itanecaster delves once more
into the secrets of
adventuring.**

AS WE WATCH MANY SIDWINDERS houses striving to improve the graphics which now illustrate most adventures, it is interesting to talk to the actual players of these modern-day myths.

While nearly everyone agrees that neatly drawn, colourful graphics can always enhance the appearance of an adventure, most of the players I have spoken to recently, also go on to say that unless the pictures have some relevance to the game play, then the graphics – either descriptive text and/or good puzzles – is what really matters.

Following this is usually a discussion on the attributes of the latest parser. These tend to become more complex as time goes by, with longer and longer sentences being understood and adorned with astounding accuracy. But do many players use these wonder-workers? Most, it seems, tend to use the least possible number of words and letters. The exception occurs when repeating a set series of commands to get to a previously attained position.

Interesting isn't it? Who are we all trying to fool? Probably the only people to gain from all this are the promoters of programs – you have to admit it sounds better if you are advertising an all-singing, all-dancing program. Then there is the newcomer to adventures, it certainly provides something to look at while waiting desperately to think about what to do next!

Let us know what you think. And give us some examples of what you like best in the order of preference. While thinking about it, try playing a text only adventure like *The Secret of St. Brides*.

Back to School

St. Brides is a real location and a real school. Only you money today there but it is no ordinary school. It is an though time was stopped 50 years ago. The secrets is straight out of those that baffle our parents used to read, although this adventure takes things a step further.

You play the part of a recently joined 'pupil', puzzled by the apparently total belief of all the others, that the school WAS and NOT IS. Your self-determined quest is to find out *The Secret of St. Brides*.

The program has been around for some time for the Spectrum but has only recently been produced for the C64. It's a Quill based game and is not easy! There is plenty of advice given but lots of things to find. The problems is working out what to do with them.

There are two approaches to the game – the basic one of tracking down what is



Come Home Mike Hammer

The latest detective adventure to hit the C64 is from US G&G's All American Adventure series. It's entitled *Misquidale*. This is a fairly middle of the road program without several features to make it remarkable. It is only available on disk, from which the graphics are called up each time they are needed and take about eight seconds to appear.

The pictures are clear and colourful and are in a semi-cartoon style that comes across well. There are three modes of presentation – text only, all graphics shown, and a neat variation called up by the command 'WALL'. This will display text only but a full RETURN flips the display into 'all graphics' until the next wall 'KILL'.

You play the part of a private-eye on the trail of a big fish in the crime world. The action is an observation and you must not expect to see everything immediately at first glance. Various messages and descriptions are not repeated so have your notebook handy!

There is a time element to your play, as the initial locations will explode two days after 75 minutes (not real time) after you start your own investigations. This could be crucial as you must intercept a telephone message before this happens!

The command interpreter is the basic VERB-NOUN input and the vocabulary does not appear to be very large. The first few letters of most commands must be given for them to be actioned. This is very important since the response to anything it does not recognise is 'SHERRY CAN'T DO THAT RIGHT NOW'. Fortunately this does not apply to direction commands (N, S, E, W) and things like inventory (I) and look (L).

The general style is reminiscent of *Minskibank* (which is now available on cassette) but it does not have quite the same polish exhibited by Activision's game. It should prove an ample challenge to the detective brigade and although not excessively difficult, is probably not to be recommended to the novice adventurer.



going on and also an additional one to find the Amulet. If you can find it and let St. Brides know, the school will award you an 'A' level in Adventuring.

The vocabulary is fairly extensive and the problems met along the way are devious – the instructions suggest that they may all be solved by logic, invention and a little homework. All I can say is that I must have missed some of the lessons where they explained this homework. I'm stuck!

A neat touch is the option to save a game position to either disk or tape (the program is on tape). It is not an expensive program but it will keep you frustrated for hours. Try it and see, then let me know what to do with the cat basket!

Diabolical

I always knew that I had a strong tendency towards the more active type of adventure games — *Halls of Death*, *The Valley*, *Excalibur*, *Ultima III* and more recently the reconstructed Temple of Apollos Trilogy — but I never thought that I would enter a program that crashed so many times, that I had come.

Just browsing through the shelves of a software emporium not far from home here, I came across *Teleengard* produced by Eclipse Software (The Avalon Hill Game Company). I thought I remembered seeing this advertised in some American magazines but could not remember it being pushed at all in this Country, so, at £2.99, I gave it a try.

There have been many attempts to reproduce Dungeons and Dragons style games on computers, some have been miserably successful, some have been purely ghastly. *Teleengard*, I find horrible, but it is true in the tradition of a D & D type of scenario.

Teleengard is a graphics adventure in which the main aim is to gain experience and find treasure while fighting off all the nasties that hinder your progress. The graphics are reasonable and the terrain mounts from the first few moves to the last moments of life.

You start at the bottom of stairs that lead up to a cavernous inn. So far so good, all around you is a maze of passages. There you must explore to find treasure, gems, gold, silver, yew, oakleaf. You start out with sword, shield and armour, all at a pretty mediocre level, because if you search diligently you can find better quality items, indicated by such as "A+7 SWORD".

All of this is very much part of the D & D colour, even the opening determination of your characteristics is very simple. You are a series of random numbers allocated to your character's attributes — strength, intelligence, wisdom, constitution, dexterity and charisma.

These series of numbers will continually be updated until you press RETURN to signify your acceptance of the present batch. This may sound as though you can cheat to get the character you want, but in practice, all this means is that you can may the result by concentrating on one or two characteristics — you are not likely to see an "all 10's" series very often! You may also choose your character's name.

The instruction booklet fairly recommends that you choose a character with a sound constitution. Here the advice well, it's based on knowledge of the game. A character's hit points are initially equal to its constitution. As these are reduced away each time you are hit by a monster, the larger the starting value the better.

And "hit points" may be regarded by a moral night's sleep as an interesting

term, it is not often possible to return alive to soldiers in time to recuperate!

Although you start with an inn, this is by no means the only inn to be found — there are lots of them. Thank the gods for small mercies! On arriving at an inn, any gold you have with you is handed safely away and your experience levelled with the amount of gold with which you arrived.

All valuable treasure — gems, silver etc. — is converted to be gold (scaled for size calculation). Neither does it matter which inn you decide to visit, they are all linked by "computer-link", a fantasy world version of Barclay's Bank!



As your experience increases, certain values trigger a change in your hit points — the means that you can take more punishment and can venture further into *Teleengard* in search of more dangerous monsters and greater loot.

Amongst the maze of rooms and corridors which you explore will be found numerous stairways that reach down into the depths of *Teleengard* — travel that way at your peril! It is quite dangerous enough to open the level three adventure to travel far from the initial position, let alone look for further enable down below!

Not only will your level be incremented by your increase in experience but also your ability to cast spells will increase. Initially you only have the skill to cast level one spells, and only one of these between cast, to rest and recuperate at one of the thoughtfully provided absealers.

Magical spells are divided into six levels of relative power. Each spell level has its own spells. Characters at experience level one or two, have only the

six spells at level one at their disposal. As characters gain levels of experience the use of higher level (and therefore more powerful) spells becomes possible.

Each three levels of experience gained, permits the use of the next higher level of spells. Spells are of roughly two types — "combat" spells and "defence" spells. The former are active offensive spells such as "magic missile", lightning bolt or "fireball". The latter allow you to cast shields, which first begin to gain through walls etc.

All commands are given via the keyboard as single key inputs and, except in the monster's training exercise (entered by calling your character's name), action takes place in "real time", so you have to leave your seat about you. There is in fact plenty of time to take the appropriate action — but it does not seem like it when you first start!

Commands are divided into two types — "action" and "movement". There are nine of the first type and they are very easy to remember. "W" for help will tell you what they are! The "movement" commands are "Fight", "Trade", "Cast" (a spell) and to pick up something you will be prompted to press RETURN. Movement is controlled by the four keys W,A,S,D (W,A,S,D) and D.

There are 30 different types of monsters roaming around *Teleengard*. Most of them are obviously opposed to your continuing existence! A very small proportion meet you with the greeting that they "like your body". That can be taken two ways to start with. Initially I thought they were going to eat me but, they actually help you, perhaps caring you of all wounds or maybe giving you a powerful weapon.

The monsters have a similar system to you and your experience, so they have a different level, this level and then rank (Gold, band — Dragon highest), determines how many experience points you gain in defeating them. It also determines how difficult they are to defeat! Although you may be only on the first level, a repeating number of powerful characters appear right from the start.

When I first came up against a level 10 Giant, I thought there must have been a glitch in the program but then I found the instruction booklet lists at level 10. As before a game of this type, some of the monsters have quite nasty habits — several drain your energy and knock you down a level of experience. Dragon line is not much less either!

There are a number of "features" such as stairways, inn, absealers, which remain at the same locations — if you can find them again. Stairways seem to crop up quite often. The nature from these includes colour as does its properties when used. Some colours are beneficial, and, so going, surprise, some are not!

There are powers to heal and also those to increase your strength. Various

PROFESSIONAL PACKAGING

Iain Murray provides a
program to smarten
up your cassette
library.

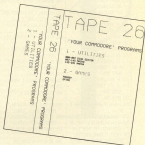
This program allows the user to produce neat inlay cards for cassette tape boxes for music tapes or computer data tapes using a Commodore 1520 Printer/Plotter. It uses many of the features of the 1520 including the four character sizes, four colours, and vertical text for the spine of the inlay.

The program requests input of the tape number, a title for the tape and for each side, and the option to list up to 10 items on the inlay of each side of the tape. If any input is made incorrectly, then pressing

RETURN or its own at the next input will cause a jump back to the previous prompt. The plotter will then produce the required inlay card.

The plotter draws an outline for cutting out and folding the card. The tape number and title are then printed, followed by the title and index for each side. The tape number and title are then printed on the spine. The character size is set automatically depending on the length of the titles required. Finally, the tape title and side titles are printed on the back flap (though if the tape title and side titles are the same, then only one will appear). On completion of the card, the option to print another is given.

Control characters in the text are detailed in preceding BDM statements, but these BDM statements need not be typed in.



PROGRAM INLAY MAKE	
10 REM ***TAPE INLAY MAKE***	80 TAB="":INPUT TNR
20 REM ***BY IAIN MURRAY	IF LEN(TNR)>25 THEN PRN
30 REM ***FOR YOUR COMMODORE	IF LEN(TNR)>25 THEN PRN
40 REM ***CASSSET***	IF LEN(TNR)>25 THEN PRN
50 REM ***C64, 1520	IF LEN(TNR)>25 THEN PRN
60 PRINT "COLOUR, WHITE, BROWN,	IF LEN(TNR)>25 THEN PRN
70 PRINT "AGENCY, SPECIAL, SPECIALLY	IF LEN(TNR)>25 THEN PRN
80 PRINT "INLAY MAKE, CASSSET"	IF LEN(TNR)>25 THEN PRN
90 PRINT "NUMBER : "	IF LEN(TNR)>25 THEN PRN
	IF LEN(TNR)>25 THEN PRN

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120 G=1
130 PRINT "DOWNDOWN SIDE"
  GOTO 110
140 INPUT "INPUT D=1" D
  IF LEN(D)=1 THEN
    IF D=1 THEN PRINT "DOWNDOWN SIDE"
    GOTO 130
142 IF LEN(D)=1 THEN GOTO 150
144 IF D=1 THEN PRINT
146 IF D=1 THEN GOTO 142
  GOTO 130
148 D=1+D
150 PRINT "DOWNDOWN SIDE"
  GOTO 110
152 D=1+D
154 D=1+D
156 D=1+D
158 D=1+D
160 D=1+D
162 D=1+D
164 D=1+D
166 D=1+D
168 D=1+D
170 D=1+D
172 D=1+D
174 D=1+D
176 D=1+D
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How it Works

10-40 set up and title
 50-100 input tape number
 110-150 input tape name
 160-200 input side titles and index entries
 210-250 ready for output
 260-300 set up printer
 310-350 draw card outline
 360-400 print tape number
 410-450 print tape title
 460-500 print side and title
 510-550 print index
 560-600 print tape number on spine
 610-650 print tape title on spine
 660-700 print side titles on back flap
 710-750 close file
 760-800 request reprint or end



Stuart Cooke puts Ariolasoft's Homepak to work.

IF, LIKE ME, YOU USE A COMPUTER FOR a lot of your work it is very important that it gives you quick access to everything that you wish to file. For example you may do a lot of wordprocessing and require access to a database or a spreadsheet occasionally. No problem, I hear you say, buy one of each program. This is a great idea, but one major thing is being forgotten, time.

The C64 and its disk drive are not exactly well known for their speed, in fact most people moan about the lack of it. A typical wordprocessor will take about five minutes to load, a database around the same. Now the problems become apparent. If you need to do a lot of swapping between programs then a lot of time is wasted loading them all in, defeating the whole point of having a computer around in the first place. Why use a database when a card index box is a lot quicker?

Obviously, if all of the programs that you require are available on one disk, a lot of time can be saved in exchanging disks etc. This is exactly what Ariolasoft has done with one of its latest releases, Homepak. A wordprocessor, database, and communications program are all available on one disk.

It is also possible to go one step further. Wouldn't it be great if all of the programs that you needed to use regularly could all be in the computer's memory at the same time? From a couple of keys and the program needed would burst into life ready to obey your every command. Team-Ware, a program that

looks extremely similar to the HT software that is found on a Plus/4, offers just this facility. With Team-Ware up to three programs can be in memory at any one time. The programs are a Word-processor, a Database and a spreadsheet. As an added bonus a graphics package, for drawing graphs, pie charts etc, is also present on the software disk.

Homepak

As previously mentioned this suite of programs goes some way to solving some of the speed problems of the C64 as all of the programs are on one disk. However they are all quite slow in loading and a great deal of disk swapping is necessary if you need to use the other programs.

Each of the available programs are extremely well presented and easy to use - the 40 page manual makes use of that - and have facilities that you would probably only expect to see on individual pieces of software costing as much as this complete package.

The manual, even though it is very good, can only be described as microscopic, it has been reduced so that it will fit inside the standard disk box that the programs come in. Get a magnifying glass if you are going to be reading a lot of it at once, you'll probably need it.

Each of the programs are dealt with in turn. Screen shots are used to give you a general idea of what you should see on the screen when certain menus are activated. And a handy crib sheet at the end of each program's documentation gives a handy reminder of the keys needed to operate the software. I must admit that I fail to see the relevance of a very large section of the manual (seven pages) being given over to an explanation



of how to use the telecommunications software with Compuserve and the Commodore Information Service, these are American software services. Come on Ariolasoft, you've gone to the trouble of printing your name on the front of the manual, why not alter the last section so that it refers to a British system too? Has one of the many bulletin boards available or even Telecom Gold. I wouldn't have thought that too many people would be phoning America so that they can follow your instructions.

Homepak - you may've guessed it - the wordprocessor, has some extremely interesting features. All of the available commands are selected from 'pull down menus' that are controlled by the function keys. This means that when you press the relevant key a menu, for example the printer format menu, will appear on the screen on top of your text, replacing the text underneath when you have finished using the menu. This is great as you never have to memorise any of the commands, such as those for headers or setting margins, as they can all be called up on screen. There is one slight gripe here however. A reminder could have been put on the editing screen so that you

could see at a glance what function key brought up which menu. It's frustrating to go through them all every time you want to do something. I suppose if you were really bothered you could always stick a bit of paper over post function keys.

When you have finished typing your latest novel you can have a look at what the page layout looks like with the view function. This 'shows a picture' of every page with each letter being represented by a dot. This does come in very useful when things need to be positioned correctly. It may even help you to spot your mistakes in the layout.

Of course all of the normal printer facilities such as underlining and spacing are wanted for, though headers and footers are dealt with in a strange way. Not only do you have to tell Homoterm where a heading starts you must also tell it where the heading finishes. This means that it is possible to have headers that run over more than one line of the paper when printed. I must admit this did leave me a little confused at first as I didn't tell the program where my header finished the first time that I tried to use this function. The view option showed that something was amiss and I was able to correct the problem before I sent the document to the printer. I told you that view was handy.

Homoterm - the database - is a little strange. In case you have never used a database I should explain how you would normally use one. Your computer is treated as an electronic card index box. You would set up a series of fields into which you should enter information. You can then ask the computer to bring you the information from what it has stored on disk. An example of a layout for a database may be:

NAME
ADDRESS
TELEPHONE

You can no doubt see where the similarity to the old card index comes in. Well, Homoterm is totally different. Yes, it is still used for information storage and retrieval but there is no fixed format as to what can be entered into the system. For example a few entries to the database may be:

Fred's Birthday's August 23rd
Joe's Birthday's June 1st
Fred's Address's 123 Main Street

As you can see you almost talk to the computer, and any information can be stored. Once the information has been stored you can ask questions such as:

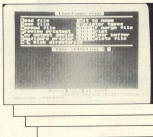
What's Fred's Address?

And the answer will appear as if by magic.

There is no provision within the program for getting printouts of specific information though it is possible to keep a printed copy of any 'conversations' that you have with the computer. And of

course information can be stored on disk for later inclusion in the wordprocessor.

Personally, I find this structure for a database very restricting. I can't see any way that you could use the program to run a mailing list or store information about a record collection. Even so the program is very clever and great fun to use. No doubt many people will love the 'friendliness' of the program and use it for just those things that I said I couldn't see a way of doing.



Homoterm I consider to be one of the most important things about this program. Modems are becoming cheaper all of the time and more and more people are becoming interested in communicating via computer. Before I go any further it is worth stating that this program is a terminal-emulation program which can be used to access bulletin boards and systems such as Telicon Gold. It is not a Vintedate type system and cannot be used with systems such as Procol or Compuser.

With Homoterm and an RS232 modem it is possible to talk to your friends who have this software and modems, swap programs with each other and talk to each other via your computer keyboard. Many of the bulletin boards now have Commodore sections on them so you can ask questions to other people who use the system etc. In fact the day of the electronic office is here. One person can write an article using Homoterm, send it to someone else via Homoterm and they can then print it out using Homoterm.

For the more technical folk out there the following data formats are catered for, ASCII, CBM (Commodore characters), Vintex and the very popular Xmodem.

One handy facility that the program has is that of macros. It is possible to set up a file that holds information such as your name, and your password. These macros can then be used to send the information required to the computer saving you a lot of typing if you access a particular system a lot.

Not much more can be said about these packages. They are all very good and would be worth a look at if the asking price was just for one of them. As I have

said I found Homoterm a little limiting but no doubt others will love it. All of the programs are well presented and easy to use. If you need any of the programs then the package is well worth the price even though some of the 'packs' may be missing that its more expensive, individual program, competitors have.

All in one

The other package mentioned is Term-Mate. What makes this program stand out from the rest is the fact that it is possible to have all of the programs in memory at any one time. Obviously, this means that you are limited to how much space is available at once for application tasks. Term-Mate gets around this in a very clever way. It allows you to choose, upon loading the software, exactly what you want in memory. Below is the menu presented when you load the software:

- (1) Desktop (3 pgs)
- (2) Plus Graph (7 pgs)
- (3) Write File (2 pgs)
- (4) Home Office (1 pgs)
- (5) Utilities

Dealing with each option in turn. Desktops comprised of a wordprocessor, spreadsheet and file manager (database) all of which are loaded into memory at the same time and very easy to switch between.

Plus Graph is a stand alone business graphics program that is used to display information from either the spreadsheet or entered by hand.

Write file comprises of the wordprocessor and the file manager both now with a help facility.

Home Office is Wordprocessor plus help and a spreadsheet plus help.

Utilities are such things as Format Disk and Rename file.

As you can see from the above breakdown quite a number of differing tasks are covered for. My personal favourite is Writefile. This allows me to have a database at my fingertips with information such as company addresses and telephone numbers, and access to a fairly decent wordprocessor at the same time. Up until now the only that this has been possible was to have two C64s on my desk.

hit the streets. Granted that the software does have its limitations, but in my eyes these are more than adequately overcome due to the software's convenience.

As with the Plus/4 only 80 lines of text can be entered into the wordprocessor. This doesn't sound too many but when you realise that a line is 80 characters a quick calculation will show that around 1800 words can be entered before you run out of room. This is more than enough for the standard letter that you wish to write. All of the usual commands are present in the wordprocessor, such as line spacing and margins. There are however some notable omissions, such as the lack of headers and footers. An interesting way of overcoming this problem is given in the manual, but none of this later.

Obviously the wordprocessor is not as sophisticated as many of its competitors. There are no fancy menus or icons in this program. Don't forget that you do have the Help function in the expanded versions which soon solves this problem.

It is remarkably easy to transfer data from both the spreadsheet and database into the wordprocessor. In fact the only

your paper back in the printer and tell the program to print the information in the database at the top of every piece of paper, done! back!

As with Homepak a preview function is also available within the wordprocessor (this function is not present in Desktop) this prints out the text to the screen as it will appear on the printer. The 80 columns of the screen act as a window over the larger 80 columns of the text.

The database or file manager is more of what I would call a real database. Before you use the program you must set up a specific format for all entries, such as the one given earlier in this article. Information is then entered as requested by the program and stored on a disk for retrieval at a later date. Again no fancy icons or prompts in this program and it is a little awkward to use in places. But it does its job and is very handy.

Commands available allow the user to move to specified records, search for a specific piece of information, review records, update records and even copy records. It is possible to sort records using a specified field. It is even possible to do a sort or disk with up to three fields.

The expanded file manager, available from write file but without the wordprocessor present, offers even more facilities for the more advanced user. Examples of added commands are 'makekeyfield' and 'showkey' which make a specified field the main field in a record, speeding up all searching and sorting and join the contents of the key field respectively.

The Spreadsheet is not exceptionally large, 50 rows by 17 columns. This means that it is not suitable for use in a large business but is great for working out budgets or totalling expenses. Don't forget you can even get the wordprocessor to print out a letter taking information from the spreadsheet making printing bills very easy. In fact one very nice touch is the ability to have half of the screen displaying the contents of the wordprocessor and the other half the spreadsheet. This makes it very easy for you to see exactly what you are doing.

The manual for each of the programs is written in such a way that even a beginner could get started without too much difficulty. All aspects of the programs are dealt with via little examples, for instance the section on the spread sheet shows how you could set up a budget sheet showing all the money that you have spent or saved.

Team-mate can only be described as the program that a lot of C64 owners have been waiting for. OK, so it has its limitations but there are ways to get around those. The fact that the programs you are going to need can be loaded into memory just the once and that data can be stored on one disk is superb. I used in the programs in the morning and that's it, everything is at your finger tips. Now I've started using the program I wouldn't be without them.



As I have previously mentioned the software is very similar to that found in the Commodore Plus/4 computer. The layout of the programs and the instructions for use are very similar. In the same, for this reason the software will probably get the same stick that the Plus/4 did when it arrived on the market, 'only 80 lines in the wordprocessor' and other such comments abounded when the basic

way to print information from the database is via the wordprocessor. It is even possible to select certain fields for printing, this makes the program very good for addressing letters or printing labels. It is this facility that allows you to add headers to articles simply leave room at the top of every page for the header when you print your text. Then set up your header as a database file, then put

PSI 5 TRADING CO.
175 Gold 174/75 09-8

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HAVING WATCHED COUNTLESS episodes of Star Trek, I always thought that Captain Kirk had things very easy commanding a space ship. Especially if you have a reliable crew to carry out your every order quickly and efficiently. Psi 5 Trading Co. from U.S. Gold seemed to be just the game I needed to prove my point. All I had to do was to select a suitable crew to enable me to deliver a cargo to some remote outpost of the universe and collect a handsome bonus. One hour into the game and I was a total wreck. My crew were leaving me but out in dispute and countermanding my orders. Instructors were moaning my cargo willy-nilly and I no longer knew whether I was coming or going.

Four fast decisions are involved with crew selection and the success of your mission

could well be put into jeopardy straight away if you get it wrong. There are five positions to be filled in the scanning, weapons, navigation, engineering and repair departments with six candidates for each job. A screen illustrating the candidates is displayed - they may be humans, aliens or cyborgs and you can call up details of each applicant before making your selection. From these resumes, you can learn about a character's qualifications, strengths and weaknesses. For example, you may learn that whilst someone knows their job inside out, they fail to process under pressure, whilst a stud might be a hero and a poor communicator but won't let an eyelid when the ship is under heavy attack.

Having agonised over your recruitment, it is on to the

mission itself. The screen depicts your communications console with your current view displayed top left and the appropriate crew member top right. The bottom half of the screen gives various status reports while the control bars contain assorted indicators for you to monitor and a menu of your current choices.

Your initial menu allows you to read all the pending messages or contact a specific department. If you don't keep in touch with sections regularly, they will go off and do their own thing. Most of your decisions involve what the Americans call prioritising - working out which order take precedence. Is it more important to get the ship travelling at full speed or should you divert some power into defence shields which down should be required first? Strangely, every department thinks that they should have priority. As things get worse, so the animated pictures of the crew show their feelings - totally laid back or glowering works. To give some idea of what you have to control, here is a quick look at the five departments and their various tasks.

The scanning department is in charge of the radar and will try to identify and track other spacecraft. In time, they can determine whether a craft is friend or foe, lock on to it and recommend which weapon is best to use against it.

Once an enemy has been identified, the weapons section can attack it with missiles, lasers, cannons and thermos. By analysing various statistics, you can assess how efficient your crew is with each weapon type.

The navigation section will estimate the time of arrival at your destination and show you the risks involved with various routes. You can change speed and take evasive action if necessary.

All sections of the ship have various power requirements and allocating that power is the responsibility of the engineering department.

It will not be long before your ship suffers damage and it is necessary to request the services of the repair section. Items can be repaired (at a higher power cost), replaceable or disposed. There are several checks at your disposal and again, you will need to decide what needs to be done, who's available to do it and how long it will take.

Control of the game is very simple via either joystick or keyboard - it is just the decisions that are difficult. There is so much going on, that it will take some considerable time to get the hang of things. Graphically, the game is stunning so you can always sit back and watch as your ship is destroyed around you. A highly original and thoroughly excellent game.

G.R.H.

PSI 5 TRADING

Amiga C-16, Plus/4

8 9 10 9



PSI 5 TRADING COM THE PART of that childhood hero Tom

The job, have crossed the sands of the Pharaoh's Curse in order

to find the treasure that was buried with him.

Instantly you know where the treasure is, at least the instructions say that you do, but in order to gain access to the treasure you must collect a number of keys that are scattered around no fewer than 178 screens. Yes, that's right, sometimes Amiga has managed to get a 128 different screens into the C-16.

You would expect that the screens would be very small in order to fit so many into the game. Well, they aren't.

Tom always stays in the same position on the screen. Whenever he moves, around it is the background that scrolls

bringing new sections of the playing area into view. An excellent bit of programming when you consider how simple many C-16 & Plus/4 games are.

Tom's journey around the tomb is hindered by all sorts of enemies. There are guards moving their spears up and down which hit and jump over - just like the arcade game *Haunted House* - monsters, spiders, snakes and collapsing floors. Tom certainly has his work cut out, even the flowers and plants scold and sound are out to get him.

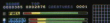
If you fancy a little adventuring then why not buy a copy and give Tom a hand?

S.C.

PHANTOMS OF THE ASTEROID

Mastertronic £1.99 C&A

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HILPERIES! FLOATING: As a great bank of rock in the sky round the outer tunnels inside, you are mercilessly assaulted

by weird-looking bug-eyed monsters whose irrational qualities allow them to pass through rock and appear where you are least expecting it.

Next, a laser detector, armed only with a pathetic laser gun which luckily has an inexhaustible power supply. Shanty music plays in your ears as you burst yourself through the maze of caves with the aid of your trusty jet pack.

Suddenly, you hit a laser-force field and death comes quickly as your whole being is pulverised and you disappear in a puff of sulphurous bubbles.

Then comes the techno fix, where you are a normal being

again, you possess only one life and must wait for the laser. Once screens to conclude several disordered bars of 'music' before you can send another unfortunate spacer to certain death.

The great force field isn't too bad since they disappear every five seconds and you can rip through. Apparently there is a way to deactivate the laser and purple ones, but I never lived long enough to find out how to do it.

This is definitely one of Mastertronic's better offerings. Spend £1.99 and die as many times as you like.

NIC

MUGGY'S REVENGE

McBosnie House £4

1 1 5 2



AS THE NIGHT CLOSED IN, my hands fumbled with the black as a flicky line darts, rattling and beating the

Muggy life in the deeps blue glow of the monitor. Colours faded and I was transported back to the bright, dry days of F&D. As Muggy blinked under the unrelenting daylight outside the classroom, the feet were clanging down on liquid. Through half-closed eyes the floor seemed to vibrate as my spirit slipped away into his mind.

First we got the boys together and made a deal with the Canadian house across the Pacific. All the gas pumps had been driven underground the night in a drought and new parkings were the harvest. All we needed were the house, the speakers, the dunes and

the clouds.

Now I bring resolutions, now it is back the output for the chairman and show a profit. I've heard the Word Brothers in record the high points in ball culture. They came up with a plain rainbow of 'Chalk'. Although getting his card marked down the Pool Hall, I'll show it each new year as a warning to any other creeps till they get bored with the message. Life is still as dull as the shine on left spots. Even the short-cuts are thick of emptiness. Everything is the progress behind a rainbow, a pig in a pole.

JO

BONGO

Amiga C-64, Plus/4

4 7 8 9



THIS VARIATION OF A PLAT-form and ladders game finds our hero trying to rescue a damsel in distress. Before the

damsel can be rescued Bongo must collect 10 sparkling gems flashing about from around the screen.

Travel around the playing area via a number of slides, trampolines, ladders and tele-transporters. Of course, movement around the platforms isn't easy as the ever-present ladder is not to stop you.

As well as collecting the pearls, Bongo can also get himself extra points by gathering the letters that are flying around the screen.

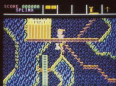
Of course there's nothing original so let's review the game for its some interesting aspects. For a

start all of the characters are extremely large and well defined, the colour palette of the C-64 and Plus/4 being used to their full. This certainly makes a change from being chased around a screen by a single colour, one-character-high monster.

Secondly, Bongo comes complete with a built-in screen debugger. Once you get tired of running around the screen, provided you have the option of debugging your own.

Well done, Amiga! A program that all games-playing C-64 and Plus/4 owners should not be without.

SC



OLDFATHER CLAIMED COPY-
rights had to be cleared around
in the production of this game-
based musical television's most
successful theatre-fiction
series. The BBC were pleased
to be associated with the
project but I suspect that the
series' creators decided that it
was against the national
interest to tussle with litigation.
No doubt, royalty fees
in the form of this situation

The result is reflected in the appearance of, dare I say it, Dali-like moments called *Concellions* who guard the DDC machine whilst the Doctor must double before the flick of the time-space continuum is lost to chaos.

The HBI (Home Instead Repayable Unit) is a temporary rolling unit. The first and last loans can be repaid, retired and replaced for good or evil reasons, by the use of the

ing films. It is therefore the real-time equivalent of tape transfer with video system. The source of its power lies in rock of Houston to crystal which is only found in sufficient quantity on the planet Rigel. For obvious reasons, this is where the U.S. has been built and it is now controlled by the Doctor's sub-machine, the Master.

The pop-punkers claim that the game starts with the familiar De Whorez. Well, it is, it may be, but I'm a scoundrel. Maybe, there were more copyright problems, but judging by the wording of the existing name it appears that we haven't missed much. I strongly advise that you play this game with the volume turned off.

The good old Police-Boy Tarbo, gradually materialized at the start of the game and once upon the Doctor and his new assistant Robin, the solemn, re-

This plate below is an amazing invention of the Time Lords and it can wander at will through the entire unobserved by all except the Doctor. It is a secret weapon in every sense of the word and if lost it will be impossible for the good Doctor to complete his mission to destroy the TARD, and rescue the alien.

Spreads can be programmed to generate a range of notes as long as it does not introduce ambiguity. Whether it satisfies these criteria or not is not important but the only way to persuade it to go up a ladder is to leave the Doctor in charge. It is, nevertheless, a very useful tool which can be seen to represent any thing which is one of the markers which the Doctor can then amend at will.

It is not long before Spilro's assistance is necessary. After a short exploratory walk around the theatre's nine prominent-like revetone, a *Blackag*, will be encountered. Normally this will first be in the form of a *Blackag* egg which hatch spontaneously at most as a suitable hard square corner case. Given *Blackag* is considered

The eggs are also jealously guarded by mother Violets, and this is a useful tip to two solutions of the first of many problems, which must be faced

The documentation with the game is superb, written in which Mississippi usually reads. Apart from the usual features and design issues

[illegible]

The District representative says that he is killed. This means that he returns to the TARDIS on the last Cyrogenic Sleep Chamber (CSC) that he passed. All of the objectives which have been injured and nuked away in his previous pools will be contained but he will always have to relocate Spiders. The CSCs have a second, important purpose: his standing next to one of these the game can be saved until another day.

Casually, the game is quite pleasant, the casual logic of the Duxies is particularly impressive. The challenges are difficult but logical and, apart from the nagging music, I wholeheartedly recommend this game.



CHANDLER

1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 26



EXAMINING THE THE full of reading errors and non-lexical reading, it was difficult sound effects. In

would be very easy to expect that a conversion of the game by the same company would be of the same high quality. Well, isn't. The only similarity between this and the Old version is the fact that you control a Commander who is under heavy pressure. No.

In this version of the game the savants are static. Before points are put out to the next level you have to clean the savants of previous generations.

The first level players were commanded to use: heavy energy (big boom energy) together, I said heavy and I mean it, if you so much as pause for a second you will certainly lose a life. There is

simple trick in this screen that enables you to get through it quickly. Dodge all of the enemy bullets, and get behind the cylinders in which the man

In the second screen our commander looks himself in front of a bridge guarded by the enemy. This is about as much as I can tell you. As soon as this screen opens, missiles and bullets are whinging their way towards you, you don't stand a chance.

In my mind the only recommendation that should tackle this game is *only with a steady state*.

SUPERBOWL

Deann
CMA



THIRD SIX, TWENTY FOUR. Thirty six. Hup! Hup! Ten, after considerable delay, Deann's *Superbowl* has finally arrived amidst considerable sarcasm, tazz and twining of pompoms. Most of the delays were due to various gameplay problems: scores of over 100 points were being recorded, but these have now been sorted out.

Fans of American Football will know that despite initial appearances, there is actually a great deal of skill involved in the game, organising tactics and running to predetermined patterns. Deann has managed to pack a lot of detail into this game although some patriotic prejudice is displayed with a reference to real football in the instructions! For people who know nothing at all about this thrilling game, there is an audio tape included in the package which gives you a quick run down on the rules, terms and basic tactics. This works very well and is a lot better than the moral 12 page booklet that you usually get.

The screen is divided into two main sections. On the right is an overhead view of the playing area. This depicts the starting positions of the move that you want to try and execute and then follows the move through once the ball has been snapped. You control one previously determined player although it is possible to change this during the course of the play if you are fast enough. Eleven runs on each side running in 42 different directions. Like quite a bit of getting used to!

The left hand side of the screen serves two functions. As a purely decorative part of the game, an action replay of the previous play appears on the giant screen. This shows the players running, throwing, tackling and catching the ball and is nicely animated although it tends to get a bit repetitive after awhile (you can stop the display with a quick press of the fire button).

The nitty gritty part of the game - deciding on positions is determined through a series of menus. Starting with the offense, an initial menu gives you the chance to try a longer short pass, a rushing play or a special play (field goal attempt, punt and goal line rush). These choices lead into sub-menus giving you a choice of starting formations with such exotic names as shotgun and split end. Selecting "view next frame" from the menu allows you to watch the players moving to their designated positions - a very useful option that gives you some understanding of the theory behind the manoeuvres. You can also change which player you want to receive the ball once like move has started.

When you are happy with your chances, the "play game" option allows your opponent (or the computer) to decide on their defensive strategy. As soon as that is ready, the move is ready to be executed. The center snaps the ball back to the quarterback while the other players start to move afield according to your instructions. A quick press of

the fire button moves the cursor around the eligible receivers starting with the one that you previously designated. As your finger is removed from the button, so the ball is thrown and the receiver comes under joystick control. He must then move to where he thinks the ball is going to land as he endeavours to catch it.

Instead of passing the ball, the offense may try to kick it, either attempting to score a field goal or simply punting to release their lines. Keeping the fire button pressed brings up a power scale showing the percentage of the maximum kick currently chosen. It is tempting to go for full range every time but this is wrong as the accuracy of a kick decreases with power.

The defense is somewhat more complicated to acquire. Apart from choosing your initial formation from 1-4-4, 4-3-4, 4-2-3 and 7-3-3, you must also decide who is going to mark whom, which players are going to go for the opponent

holding the ball and which offensive players will remain unmarked. Again, you can decide which player you wish to control in the ensuing move (number 7) William "The Fridge" Perry is likely to be a popular choice.

Superbowl is the best American Football game seen to date. Based on the January's game in which the Chicago Bears thrashed the New England Patriots 49-10, it is an extremely credible situation. Devotees of the game need look no further. For people who know absolutely nothing about the game, why not try your hand before the new season starts on Channel 4.

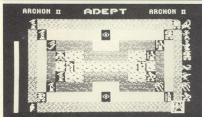
G.H.H.



ARCHON II: ADEPT

AtariSoft
£12.95, joystick required, C64

10 10 10 10



ARCHON WAS ONE OF THE most original strategy games ever written, justifiably winning several awards. Now Electronic Arts has released a sequel on the AmigaSoft label. Archon II: Adept sees you taking sides in an epic struggle between the Master of Order and the Mistress of Chaos in a game featuring both strategy and arcade elements.

The strategy takes place on a screen featuring the four classical elements representing the classical elements of Earth, Water, Air and Fire. In addition, there are two neutral squares which represent the void and the home squares for each side – the bastions of Order and the Temple of Chaos.

The aim of the game is to occupy six power points, two of these are the void squares and the other four are the outer corners of the elemental bands. These four points in turn form band to band. You can also win by the total annihilation of the opposition's forces.

You start the game with four adepts – one in each element. Each turn, they can either move or cast a spell providing that you have sufficient energy to carry out your choice. There are seven spells to choose from but the one that you will use more than any other is "summon". This is used to bring another piece on the board.

The other spells available to you are: heal one of your

pieces, weaken an opponent's piece, imprison an enemy, release one of your own imprisoned pieces, banish a hostile enemy or something called apocalypse which is a final battle used to put your adversary out of his misery. Casting spells costs varying amounts of energy depending on its potency. How much energy you have at your disposal depends on how many power points you occupy.

There are two types of pieces that can be summoned, demons and elementals. Both sides have the same demons at their disposal – juggernauts, wraiths, gorgons and chimeras while their elementals are different. Order can call on the services of a giant, hawk, thunderbird and salamander, representing earth, water, air and fire while Chaos has a behemoth, slime, fire and firebird available to him.

All these characters have different strengths and weaknesses, when it comes to combat. Some for example just have to sing and the opposition starts to die. Salamanders hurl fireballs, gorgons paralyse while wraiths get stronger as you get weaker – they are also invisible most of the time and so make extremely formidable opponents. Not quite as bad as a juggernaut though which is best described as pure energy on wheels. It just annihilates opposition out of the way.

Combat occurs when two

pieces want to occupy the same square. The worse switches to the battleground where you must make instant decisions as you try to probe the opposition's weaknesses and utilise your own strengths to their best advantage. Each piece's strength is displayed as an energy bar down the side of the screen. This reduces for each successful wound inflicted. When the bar reaches zero, the score dies leaving the victor in sole possession of the disputed square.

As might be expected, pieces fight best when in their home element e.g. brakers in the water band. After you have fired your thunderbolt or whatever, it takes time before you are allowed to fire your next. This time interval varies from piece to piece and the computer lets you know with a ping – high or low depending

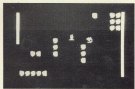
on which side you're on. The battle ground has a number of barriers which must be dodged round or used strategically. The different elements have differing effects on enemies and items. For example, fire rounds an item but leaves metals untouched whilst earth destroys metals and slows items.

Control of the game is entirely via a joystick. Spells are selected from a menu while movement is achieved by moving a square shaped cursor. Moving round the combat screen is a straightforward. Aiming a missile involves pressing the fire button and moving the joystick in the desired direction. Adepts can move their missiles whilst in flight – a useful trick to know.

Archon II features a wide range of options to choose from. Which side you play, number of players and their skill levels. Be warned though, the computer plays a very mean game and you are likely to be thrashed in your first few games. I would strongly recommend that you watch the demonstration games a few times so that you can get some idea of the strategies and tactics required.

Archon II is an excellent strategy game and one that will take you a lifetime to master – then you can play with the other side and learn a totally new set of tactics. While it doesn't quite reach the exalted standards set by the original, that is no real criticism and the game can be unreservedly recommended.

G.F.H.



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IT'S THREE O'CLOCK IN THE MORNING. You sit at the computer keyboard, testing just finished a marathon typing session reviewing one of the reports programs from your Commodore. Your fingers reach for the keyboard and press the letters R, U and N. You sit back expectantly and...nothing happens.

Well, I'm sure that we have all had problems before now. Where it does happen it's a matter of spending hours searching through the programs for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

Here, at Your Commodore, we pride ourselves on the quality of listing that we print. Unfortunately, this usually means that they are also very long, thus taking longer to type in and leaving more room for errors. All of the listings in Your Commodore are taken straight from a printout of working programs, it is therefore very unusual for errors to appear in the magazine.

Because of the length of our programs, we do get a large number of requests from readers who would like us to put specific

SOFTWARE FOR SALE

programs on tape or disk for them. Obviously this is very time consuming and means that we can't spend as much time working on the magazine as we would like.

We are therefore proud to announce the start of the 'Your Commodore Software Service'. Most of the programs from each issue of the magazine will now be available on a single cassette for a price of just 14.00. We will not be making disks available since they would have to be a lot more expensive and more difficult to post. This shouldn't cause you any

problems though as most of the programs will be protected and it will be a simple matter to save the programs to disk yourself.

All programs on the cassette will be saved using a tape turbo routine. However, we cannot guarantee that all programs will work correctly with this turbo routine present. We therefore recommend that before you use any of the programs you make a copy of the programs on your own cassette or disk and use this version of the program not the original.

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SPRITE IDEAS

When you are designing a game one of the longest jobs is designing the sprites. If you are good at art then fine, if not your next monster will probably end up looking like a square box with legs.

Now, Your Commodore comes to the rescue once again with Sprite Ideas. If you have designed any sprites for games and you don't mind other people seeing your masterworks then why not send them into us. Each month we will be offering £10 for the best entries.

Your sprites can be anything at all (within reason), if you've designed a series of animated characters then send in the lot. We'd love to have a look at them.

So, next time you are after an Ogor to put in your new game, have a look in this section of the magazine and you may find just what you are looking for.

This month's sprites are from Aman Khan from Hayes, Middles.



```

5: POKE(128),0:POKE(129),0:PRINT:GOTO 1000:REM SETS UP SCREEN COLOURS AND CLEARS FOR
REM
10: POKE=0000487:GOTO(POKE(128)+1,0):NEXT:REM POKE DATA INTO 1288 ONWARDS
20: REM ONCE DATA HAS BEEN READ IN ONCE TYPE RUN 1288 TO RUN THE PROGRAM AGAIN
300: REM FRAME ONE...SPRITE ONE
305: DATA 0,18,0,0,170,0,80,270,0,250,80,0,250,170,0,250,240,18,250,240,10,250
310: DATA 110,20,250,80,80,110,80,80,250,80,80,250,80,80,250,80,10,250,110,0,250
320: DATA 0,110,80,0,110,80,0,80,250,0,80,250,0,110,80,0,110,80,0,110,80
400: REM FRAME ONE...SPRITE TWO
405: DATA 10,0,0,110,170,0,80,250,0,110,170,0,80,250,180,80,250,180,80,250,180
410: DATA 110,250,80,80,110,80,250,110,80,250,80,80,250,80,250,80,10,250,110,80,250
420: DATA 110,80,110,80,80,110,80,80,80,80,80,80,80,80,80,80,80,80,80,80,80
500: REM FRAME TWO...SPRITE ONE
505: DATA 0,18,0,0,170,0,80,240,80,240,80,0,240,80,0,240,80,18,240,80,10,240,80

```

218 SAT245.0,40.0,20.0,83.88,117.89,87,251.87,87,61.88,88,88,113,89,15,219.89
 244 SAT25.88,82.0,117.88,0.88,88,0,0,21,108,0,1,179,0,0,12,0
 274 MON FRAME TWO...WHITE TWO
 370 ORBIT180.0,0,100,190,0,0,0,120,0,120,288,0,88,288,190,100,100,190,117,288
 340 ORBIT180.19,117,288,88,87,253,117,87,288,288,288,190,100,288,247,288,288,190
 270 ORBIT127,388,112,112,288,88,8,248,84,87,213,84,88,113,0,88,88,0,179,88,0
 280 ORBIT180,0,0,0
 380 MON FRAME THREE...WHITE ONE
 388 ORBIT1,0,10,0,108,0,21,127,0,87,203,0,87,93,1,88,210,18,88,127,81,88,89
 330 ORBIT80,88,87,248,88,127,288,88,288,190,87,203,100,0,288,81,88,288,15,88,127
 340 SAT18,87,87,0,88,87,0,117,88,0,20,180,0,1,179,0,0,12,0,0,0
 350 MON FRAME THREE...WHITE TWO
 370 SAT180,0,0,148,84,0,288,288,0,207,270,0,208,288,181,127,288,190,288,288
 340 ORBIT180,288,288,288,87,288,190,207,270,270,288,288,288,288,288,288,288,288
 270 SAT127,288,128,128,128,128,118,80,240,88,44,213,88,84,113,87,0,87,84,0,183,84
 280 ORBIT180,0,0,0
 400 MON FRAME FOUR...WHITE ONE
 408 ORBIT1,0,10,0,108,0,21,127,0,87,203,0,87,93,1,88,210,18,88,127,81,88,89
 418 SAT1107,21,87,87,87,127,87,88,288,288,87,288,247,21,288,288,31,288,288,89
 428 SAT1107,113,1,127,87,1,43,88,0,88,88,0,21,80,0,0,179,0,0,12,0,0
 438 MON FRAME FOUR...WHITE TWO
 438 SAT180,0,0,120,190,0,288,288,0,207,270,0,208,288,182,288,288,190,288,288
 448 SAT180,288,288,288,288,288,244,207,270,87,288,288,288,288,288,288,288,288
 478 SAT1127,88,84,117,88,148,88,127,181,88,87,182,88,87,87,88,84,0,188,84,0,188
 500 MON FRAME FIVE...WHITE ONE
 508 SAT180,0,10,0,0,204,0,12,270,0,288,288,0,247,288,0,100,127,88,127,288,31,87
 518 SAT1288,88,87,270,270,270,288,288,247,288,288,288,288,87,288,43,288,43,288,117
 528 SAT119,87,87,0,88,1,88,88,0,88,88,0,12,88,0,0,108,0,0,10,0
 538 MON FRAME FIVE...WHITE TWO
 538 ORBIT180,0,0,107,180,0,288,288,0,248,288,0,213,288,180,288,288,190,288,288
 548 SAT178,270,270,270,84,288,288,219,288,87,213,288,88,88,180,88,88,248,127,88,89
 560 ORBIT180,84,87,88,112,127,127,190,87,87,182,88,88,0,248,84,0,179,84,0,180,8,0
 580 ORBIT0
 600 MON FRAME SIX...WHITE ONE
 608 ORBIT1,0,10,0,108,0,21,127,0,87,203,0,87,93,1,88,210,18,88,127,81,88,89
 630 ORBIT80,88,87,248,88,127,288,88,288,190,87,203,100,0,288,81,88,288,15,88,127
 640 SAT18,87,87,0,88,87,0,117,88,0,20,180,0,1,179,0,0,12,0,0,0
 650 MON FRAME SIX...WHITE TWO
 650 SAT180,0,0,170,181,0,288,244,0,288,248,0,248,270,84,288,288,183,288,247,88
 660 SAT180,88,87,213,127,87,213,248,88,88,88,88,88,88,88,88,88,88,88,88,88,88,88
 678 SAT18,117,127,288,84,127,288,84,88,127,0,88,84,0,180,84,0,180,8,0
 700 MON FRAME SEVEN...WHITE ONE
 700 SAT180,0,10,0,108,0,21,127,0,87,203,0,87,93,1,88,210,18,88,127,81,88,89
 710 SAT180,88,87,248,88,127,288,88,288,190,87,203,100,0,288,81,88,288,15,88,127
 720 SAT18,87,87,0,88,87,0,117,88,0,20,180,0,1,179,0,0,12,0,0,0
 730 MON FRAME SEVEN...WHITE TWO
 730 ORBIT180,0,0,107,84,0,288,84,0,288,87,0,288,183,190,247,87,240,88
 740 SAT18,124,1,87,124,248,88,88,88,88,88,88,88,88,88,88,88,88,88,88,88,88
 760 ORBIT180,288,87
 800 MON FRAME EIGHT...WHITE ONE
 800 ORBIT0,0,10,0,108,0,21,127,0,87,203,0,87,93,1,88,210,18,88,127,81,88,89
 810 ORBIT80,88,87,248,88,127,288,88,288,190,87,203,100,0,288,81,88,288,15,88,127
 820 SAT18,87,87,0,88,87,0,117,88,0,20,180,0,1,179,0,0,12,0,0,0
 830 MON FRAME EIGHT...WHITE TWO
 830 ORBIT180,0,0,107,84,0,288,84,0,288,87,0,288,183,190,247,87,240,88
 840 ORBIT127,288,88,190,270,87,88,248,88,87,248,88,87,248,88,87,248,88,88,288,88
 860 ORBIT127,240,117,87,181,213,88,182,88,88,0,148,84,0,288,84,0,180,8,0
 900 MON FRAME NINE...WHITE ONE
 908 ORBIT1,0,10,0,108,0,21,127,0,87,203,0,87,93,1,88,210,18,88,127,81,88,89
 918 ORBIT80,88,87,248,88,127,288,88,288,190,87,203,100,0,288,81,88,288,15,88,127
 920 SAT117,21,1,127,87,0,88,88,0,88,88,0,12,180,0,0,179,0,0,12,0,0
 930 MON FRAME NINE...WHITE TWO
 930 SAT180,0,0,88,84,0,85,184,0,247,270,0,288,288,44,288,288,190,127,270,248
 940 ORBIT127,288,212,127,288,84,88,248,88,87,88,88,88,87,288,88,127,288,84,88,288
 960 SAT188,84,288,88,87,248,84,87,213,84,88,21,0,88,84,0,288,84,0,180,8,0,0
 1000 MON FRAME TEN...WHITE ONE
 1008 ORBIT0,0,10,0,108,0,21,127,0,87,203,0,87,93,1,88,210,18,88,127,81,88,89
 1018 ORBIT80,88,127,248,88,88,88,88,87,88,88,87,88,88,87,88,88,87,88,88,88,88
 1040 SAT113,87,1,87,87,88,88,0,21,88,0,1,179,0,0,12,0,0,0
 1080 MON FRAME TEN...WHITE TWO
 1080 SAT180,0,0,148,84,0,288,288,0,212,0,288,88,0,288,117,88,288,247,84,288,190,89
 1090 ORBIT180,213,88,288,88,88,248,87,88,88,88,288,88,88,88,88,88,88,88,88,88
 1095 SAT180,88
 1180 MON FRAME ELEVEN...WHITE ONE
 1188 ORBIT1,0,10,0,108,0,21,127,0,87,203,0,87,93,1,88,210,18,88,127,81,88,89
 1198 SAT180,88,127,288,88,88,248,88,87,88,88,87,88,88,87,88,88,87,88,88,88
 1198 SAT127,1,87,248,1,87,213,0,88,21,88,21,88,0,1,188,0,0,12,0,0,0
 1200 MON FRAME ELEVEN...WHITE TWO
 1200 SAT180,0,0,108,84,0,288,288,0,88,125,0,117,88,181,248,87,181,181,88,87,248
 1208 SAT1213,288,112,88,88,88,88,87,248,88,88,248,88,88,248,88,87,248,88,88,288
 1258 ORBIT80,88,113,88,88,84,87,88,88,88,0,248,84,0,179,84,0,288,8,0,0,0
 1300 MON FRAME SEVEN OF THE PROSECTIONS
 1308 V=81240,POKE21=1,POKE27=89,1,POKE30=40,1,POKE37=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
 13180 T
 1318 FORKEY=11,0,POKEY=18,0,POKEY=37,0,POKEY=38,0
 1318 FORKEY=170,POKEY=2,0,POKEY=1,125,POKEY=3,1,125
 1370 A=107
 1370 MON THIS PART SPIN THE PLANET
 1400 POKE1040,0,POKE1041,0,1
 1500 POKE=070128,POKE1,0,0,0,1,0,0=0147881280
 1580 ORBIT180

Listings will be much easier to
 enter with our new system.

COMMODE LISTINGS ARE RATHER well known for the horrible little black blobs that always abound. Unfortunately the graphics characters which are used to represent graphic and control characters do not reproduce very well and they are also difficult to find on the Commodore keyboard.

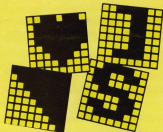
In future all control and graphics commands will be replaced by a mnemonic within square brackets. This mnemonic is not typed out as printed in the magazine but rather the corresponding key or keys on the keyboard are pressed. For example [RIGHT] means press the cursor right key, you do not type in [RIGHT]. All of the keywords, what keys to press and how they are shown on the screen are shown below.

Any character that is accessed by pressing shift and a letter will be printed as [Letter].

[SA] shift and A
[S] shift and +

Any character that is accessed by pressing the Commodore key and a letter will be printed as [Letter].

[CA] Commodore and A
[C+] Commodore and +
[CT] Commodore and T



LISTINGS

If any characters are repeated the mnemonic will be followed by a number. This number is how many times you should enter the character. Any number of spaces over one will also be represented in this form.

[RIGHT10] press cursor right 10 times

[C+10] press Commodore and + 10 times

[SPC10] Press the space bar 10 times

Any other characters should be easily recognisable for example CTRL-N means press CTRL and N and LEFT-ARROW means press the left arrow.

Any number of mnemonics can be enclosed in brackets for example

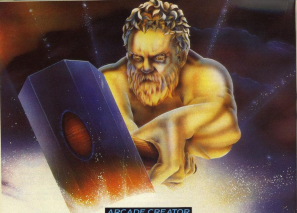
[A10][SPC10][A10]

means type 10 shift A's 10 spaces and another 10 shift A's.

Mnemonic	Symbol	what to press
[RIGHT]		left/right
[LEFT]		shift left/right
[UP]		shift & up/down
[DOWN]		up/down
[F1]		F1
[F2]		shift & F1
[F3]		F3
[F4]		shift & F3

Mnemonic	Symbol	what to press
[F5]		F5
[F6]		shift & F5
[F7]		F7
[F8]		shift & F7
[CLEAR]		shift & CLR />0000
[HOME]		CLR->0000
[BAYSON]		CTRL & 9
[KVSCHFF]		CTRL & 8

Mnemonic	Symbol	what to press
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8



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Your
COMMODORE
READER'S



S

U

R

V

E

Y



1. Would you please tick the box against the statement which best describes how much of Your Commodore you normally read or look through:

- Read or look through most or nearly all the articles/features ☐
 Read or look through some of the articles/features ☐
 Just read or look through the occasional article/feature ☐

2. With regard to the advertisements in Your Commodore, do you:

- Read or look through most or nearly all of the advertisements? ☐
 Read or look through some of the advertisements? ☐
 Just read or look through the occasional advertisement? ☐
 Very rarely/never look at the advertisements? ☐

3. Thinking specifically about the advertising content of Your Commodore, would you please rate the two main types of advertising matter - Display and Classified - in terms of usefulness (please tick one against each type):

- | | Display | Classified |
|-------------------|--------------------------|--------------------------|
| Very useful | <input type="checkbox"/> | <input type="checkbox"/> |
| Useful | <input type="checkbox"/> | <input type="checkbox"/> |
| Not very useful | <input type="checkbox"/> | <input type="checkbox"/> |
| Not at all useful | <input type="checkbox"/> | <input type="checkbox"/> |

4. Have you ever ordered or bought equipment/products after reading an advertisement in Your Commodore?

- Regularly ☐
 Occasionally ☐
 Never ☐

If the answer to Question 4 is yes, what was the last item you purchased in this way and what was its value?

5. Does anyone else read your copy of Your Commodore?

- No ☐
 1 or 2 ☐
 3 or 4 ☐
 More than 4 ☐

6. Do you keep your copies of Your Commodore for:
 One month? ☐
 Three months? ☐
 Six months? ☐
 A year or more? ☐
 If YES, PLEASE ANSWER THE NEXT QUESTION.

7. How often do you refer to back issues of Your Commodore?
 Once a week or more often ☐
 About once a month ☐
 Once every three months ☐
 Less often ☐
 Never refer to back issues ☐

8. What magazines other than Your Commodore's competitors do you read?

.....

9. What Daily newspaper do you regularly read?

- Daily Mail ☐
 Daily Express ☐
 Daily Mirror ☐
 The Sun ☐
 Today ☐
 The Guardian ☐
 The Times ☐
 The Daily Telegraph ☐
 Financial Times ☐

10. What Sunday newspaper do you regularly read?

- Sunday Times ☐
 Sunday Telegraph ☐
 The Observer ☐
 Sunday Express ☐
 Mail on Sunday ☐
 News of the World ☐
 Sunday People ☐

11. Name the three television programmes you view most regularly.

.....

12. Which computer(s) do you own?

- C16 ☐
 Plus/4 ☐
 C64 ☐
 C128 ☐
 Vic 20 ☐
 PET ☐
 Spectrum ☐
 Amstrad ☐
 BBC ☐
 Electron ☐
 Atari ☐

13. Do you own one of the following disk drives?

- 1541 ☐
 1550 ☐
 1575 ☐
 1577 ☐

14. Do you own any of the following printers?

- Commodore printer ☐
 Epson-compatible printer ☐
 Other ☐

15. Do you own any of the following peripherals?

- Keyboard ☐
 Lightpen ☐
 Mouse ☐
 Graphics pad ☐

16. How long have you had a Commodore computer?

- Less than three months ☐
 Three to six months ☐
 Seven months to one year ☐
 One year to two years ☐
 Over two years ☐

17. Do you use your computer for the following:				
Original programming	All the time	More than half the time	Sometimes	Never
Typing in game listings				
Typing in utility listings				
Playing games				
Educational uses				
Business uses				

18. Who else uses your computer?

- ☐ Nobody
☐ Spouse
☐ Parent
☐ Children
☐ Friends
☐ Other

19. How much do you estimate you have spent in total in the last 12 months on your computing activities?

- ☐ 0-100
☐ 101-100
☐ 101-200
☐ 201-500
☐ 500-1000
☐ 1000-1500
☐ 1500-2000
☐ Over 2000

20. How much do you expect to spend on hardware over the next year?

- ☐ 0-100
☐ 101-100
☐ 101-200
☐ 201-500
☐ Over 500

21. How much do you normally spend in a 12-month period on the following types of software?

22. Do software reviews influence your buying?
☐ Yes
☐ No

23. Were you previously a regular reader of Your Commodore before we incorporated Your 44? Yes ☐ No ☐

27. Were you previously a regular reader of BOSH Your Commodore and Your 44? Yes ☐ No ☐

28. Since we incorporated Your 44, do you think that Your Commodore is:
☐ Better
☐ Same
☐ Worse
 PLEASE STATE WHY

29. What do you think about the balance of articles in Your Commodore?

	More	About	Less
How	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Programming articles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Software reviews	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hardware reviews	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Book reviews	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Games to type in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Utilities to type in	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business page	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Advertorial columns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Letters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Competitions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What else would you like to see in Your Commodore?

32. Are you aware of Your Commodore's scheduled publication date?

- ☐ Yes
☐ No

33. If you answered yes to Question 32, do you attempt to purchase the magazine on that day?

- ☐ Yes
☐ No

34. Do you normally obtain your copy by:

- ☐ Casual purchase
☐ Postage home delivery
☐ Postage shop collection
☐ Subscription

35. If you do not obtain your copy by subscription, is it due to one of the following?

- ☐ Subscription too expensive
☐ Good availability through local newsagent
☐ Not every issue is required
☐ Have subscribed previously but lapsed

36. If you do not subscribe, from which type of newsagent do you most often obtain your copy?

- ☐ High Street shop
☐ Estate shop
☐ Travel Point
☐ Corner shop

37. Are you a member of a computer club?

- ☐ Yes
☐ No

If yes, please give details

	Games	Business Software	Educational Software	Utilities
0-150				
151-300				
301-450				
451-600				
601-750				
751-900				

38. Do software charts influence your buying?

- ☐ Yes
☐ No

39. Which listings do you type in?

- ☐ All
☐ Some
☐ None
☐ Games
☐ Utilities

34. Please tick the box which best describes you:

- ☐ New reader within the last 3 months
☐ Established reader
☐ Occasional reader

35. Were you previously a regular reader of Your 44?

- ☐ Yes
☐ No

31. Which other computer magazines do you regularly buy?

- ☐ Commodore Horizons
☐ Commodore User
☐ Commodore Computing International
☐ Zap! 44
☐ Complete
☐ Your Computer
☐ Popular Computing Weekly
☐ Personal Computer World
☐ Other

- ☐ Marital status
☐ Sex
☐ Age
☐ Occupation
☐ Number of children

☐ We would like to thank you very much for your help. The information will be regarded as confidential and will be used solely for the purpose of the survey.

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Mr. AL. Black	36100 Air Stone Street	Nottingham	NN11 1AA
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GAME

of the month

Gordon Hamlett explores the complexities of US Gold's *Ultima IV*.

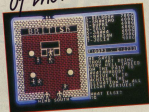
SINCE THE MENACE OF ERODUS WAS destroyed, Lord British is looking for someone to improve the quality of life throughout the land of Britannia. This involves finding or achieving something called *Ayuda* about which, eerily, nobody has heard and nobody appears to know anything.

How you come to be volunteered for this quest is an interesting story. While walking in the countryside, you see a bright light and hear a strange noise from there on, things get confusing and confusing and you are irresistibly lured by some music into a gipsy caravan. There, an old woman asks you some questions based on honour, valour, justice and other virtues. Depending on your answers, your character is assessed and your profession determined. This may be one of eight types including fighter, mage, thief and ranger.

The land of Britannia is a large and varied place. There are eight major towns, each one specialising in one of the eight professions. The people inside are friendly and you will need to talk to everyone you meet, trying to glean useful scraps of information. There are castles and villages to be explored too - if you can find them. Outside all the towns, the land is more hostile - wandering bandits orcs, ogres, trolls and two-headed entities etc. roam the countryside intent on trying to kill you. The land itself can also be hostile - swamps give off poisonous gases that can rapidly deplete your strength although there are healers in several of the towns who will cure you - for a price.

There are dungeons to be discovered and explored, and monsters to be sought out. Travel is usually on foot although you may be able to buy, steal or borrow horses to speed up your journey. You will certainly need a ship to visit the islands, not all of which are on your map and you will have to learn how to use the moonpath efficiently. There is also rumoured to be a balloon or something similar hidden away.

As you travel the land and talk to the people, you can try and persuade them to



join your party. Up to seven others can join - one from each of the other profession types - paladin, bard, thief and cleric, being the others. Some will only join you when you possess yourself worthy to a certain degree. Experience points are awarded for killing an enemy. Well, hard fought and he will guarantee you when you have gained sufficient points.

Magic plays a crucial part in the game. There are 36 spells to be mastered but before you can think about casting one, you need to know the ingredients and mix them in their correct proportions. There are six main ingredients that can be bought at any good herb shop but all the powerful spells require minerals or ingredients which are not so easily come by. The spells range in power from simple ones, such as healing wounds or casting a magical light, through herbals and assorted protections to kill and cure - a pretty little trick that causes your opponents to attack themselves instead of you. Eventually magical lightning and deep herbs has some magical ability although how much depends on your job and experience level.

There is a lot of fighting to be done if you are to attain your quest. Combat takes place on a variety of tactical displays and you can move, attack or cast spells for each of your characters in turn. How the battle goes depends on what weapons

and armour your party owns and how you deploy your forces. The use of slings and bows, especially by the members at the back of your party is recommended. The mages - over 20 different types - fight intelligently and will run away if hard pressed leaving behind a treasure chest, although this is frequently trapped as you try to open it.

So what of the quest itself? The first part involves attaining a great Avatar-based in the eight virtues - honour, valour, humility, sacrifice, honesty, compassion, justice and spirituality. The seven Hawkwind keeps you informed as to your progress and should be visited frequently. At the appropriate time, you have to go and meditate at a shrine - provided that you have found the correct route to gain your admission and have learned the appropriate mantra to chant. Only then will you be granted a vision. Apart from that, you will need to find some coloured stones - I found the red one on the right level of Dungeon Descent. After that, I don't know apart from the fact that there will be some final conflict in a place known only as the Abyss.

Other things to look out for are secret passages (which abound in caves and dungeons) and the guild where you will need to purchase magical keys and gems useful for mapping dungeons. A sextant will also be an essential purchase

if you can find someone to sell you one. Above all, you gain information and write everything down. The amount of work and expense that you have to put into gaining even the smallest clue is phenomenal.

The display is in three main boxes. A large map displays your current position (line of sight vision only). The top right hand box displays the statistics for you and your party while the bottom box is used for command entry and as a general information box. Everything in the game is controlled by single keyboard commands apart from conversations which usually only require a single word. The game comes beautifully packaged with two large books, a map and a reference card.

Ultima IV is a superb game and seems ahead of any of its rivals. To date, I have played it for well over 40 hours and still feel that I have only scratched the surface of it. If you only buy one game this year, make sure it's Ultima IV.

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T P D R W

Allen Webb explores the complexities of medium-res graphics.

Everyone validates on about high resolution graphics and how they can be used for brilliant effects and works of art. I am equally guilty having in the past discussed their use (January issue). For some applications, however, it may be possible to settle for a lower resolution system.

The OGA, in common with most other micros, has a resident set of standard characters. Arrange these in a manner which represents squares one-quarter the size of a normal character. These squares can be used to plot lines or dots. Using this system you can achieve a resolution of 80 points across and 80 points up. Whilst you may not consider this too much of an idea, I recently saw two superb pictures drawn in this resolution. This emphasises that artistic ability can overcome system limitations. Remember, also, that Jeff Minter's excellent *Psychodelia* was this sort of resolution.

The routines given here give you complete control over the drawing of lines and dots and the manipulation of screen area.

The commands have the following syntax:

ti Dot
SP, YP, XP, YP, MODE
COLOUR
SP, YP are the coordinates of the dot.
MODE decides how the dot is drawn:
0 — draws the dot

1 — draws the dot
2 — fills the dot i.e. sets it if it's clear, clears it if it's set.

COLOUR specifies the colour of the dot. Values of zero to 15 change the colour. A value of 16 leaves the colour unaltered.

ti Line

XP, YP, X2, Y2, COLOUR
COLOUR
XP, YP, X2, Y2 are the co-ordinates at the ends of the line.

ti Area manipulation

XP, YP, X2, Y2, COLOUR, MODE
COLOUR, MODE
COLOUR specifies the position of the top left hand corner of the area.

XP, YP are the co-ordinates at the top left hand corner of the area.

XP, YP are the co-ordinates at the top left hand corner of the area.

COLOUR acts in the same way as the previous commands.

MODE has the effects:
0 — EOR's the area i.e. changes it to inverse field. Repeating the command restores the area.

1 — fills the area with the character specified.

CHARACTER is only required if MODE equals one. A syntax error is generated if it is omitted when MODE=0 or if it is omitted when MODE=0. The character value is the POKE value that will set the value of 128 in the area and a value of one fills the area with the letter A.

This command acts on a 40 by 25 resolution and, as before, out of range values are ignored.

I've included a simple demonstration which shows some ways of using these commands. The first uses shades of grey and dotted lines to give a 3D effect. The second is just pretty and uses the area command to OR the pattern.

MODE has the following effects:

0 — draws the line.

1 — draws the line.

2 — fills the line.

3 — draws a dotted line.

COLOUR is the same as for the dot command.

Both the dot and line commands use the 80 by 80 resolution with the origin in the bottom left corner of the screen. All out of range values are ignored.

PROGRAM LOW RES LOADER

```
2000 FOR L=0 TO 24:GOTO 40
40 FOR Y=0 TO 15:REPEAT 4
  50 CHAR=POKE 17124,114+
  60 Y:GOTO 80
80 REPEAT 40
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```


Allen Woods takes you
one step further in
your quest to master
machine code.

WELCOME TO THE MACHINE

LAST MONTH WE STARTED TO look at various ways of moving data about. Whilst we concentrated on the colour, the principles apply equally to movement of data anywhere. I hope you found the homework easy. With the material we covered last time, you should be able to come up with two or three solutions to each problem.

First, I started a routine to get a row of text along the top of the screen. Here is one solution:

```
10 ASSEMBLE 100,1
100 REM **40000
110 REM LDA 179
120 REM 58 4110
130 REM LDY 40
140 REM LDA 142
150 REM 100CF 58 5910
160 REM INY
170 REM CPY 148
180 REM BNE 100CF
190 REM RTS
200 REM ]
```

This uses the print character routine in ROM to print whatever is to the screen at the current cursor position. Lines 110 and 120 print HOME (CHR\$(13)). I used this method since there is no need to worry about updating the colour matrix. Those of you with old ROMs will no doubt be aware that when you set the cursor colour, the colour matrix is not updated. That means that if you move data direct to the screen memory, you will not necessarily get the colours you want. New ROMs do have had this fixed.

The second problem asked you to print the character set on the screen. Here is my solution:

```
10 ASSEMBLE 100,1
200 REM **40000
```

```
110 REM LDY 40
120 REM 100CF 114
130 REM STA 8400, Y
140 REM LDA 17
150 REM STA 50008, Y
160 REM INY
170 REM 8401 100CF
180 REM RTS
190 REM ]
```

In this routine, I have used simple indexing to put characters at the start of the screen memory. Since I don't want to change the address indexed, indirect indexing is unnecessary. There are 256 characters with PC000 values ranging from zero to 255. I use this fact in line 120 by using the Y register to update the character to be PC000. Lines 140 and 150 take care of the colour matrix for old ROMs routines. The Basic equivalent to this routine is:

```
10 FOR I = 0 TO 255
20 POKE 18141,I
30 POKE 50796,I
40 NEXT I
```

Line 120 acts in a slightly different way to the looping we've used previously, but it's easier than that.

There is one more addressing mode which you should be aware of. This is an infrequently used mode called the Indexed Indirect Addressing. This mode uses the X register to look for an address in a table and act on the address. The mnemonic for this mode has the form:

(address,X)

where address is a zero page location. Here are some examples:

```
LDA (88,X)
STA ($AA,X)
```

Its operation takes a little understanding, but here is what it does. Imagine that you have a table of 16 bit addresses stored in a table in zero page starting at \$AA.

```
$AA low byte address 1
$AB high byte address 1
$AC low byte address 2
$AD high byte address 2
$AE low byte address 3
$AF high byte address 3
and so on...
```

If X contains the value zero, the instruction LDA (\$AA,X) does the following:

a) To add the contents of X (i.e. zero) to the address \$AA to give \$AA.
b) The accumulator is loaded by the contents of the address held in the resulting byte pair \$AA and \$AB.

Similarly, if X contains two, then the accumulator will be loaded with the contents of the address pointed at by \$AC,\$AD.

This is not an addressing mode that you will use often, but it's worth knowing about, in case you have a need for it one day.

Last month, I introduced the use of conditional branching. At that time, it was simply to allow us to make progress and I made no attempt to discuss at length. It is now necessary to look at it in some depth.

In the microprocessor is a register called the Status Register. This eight bit register is used to hold several flags, each using one bit. The flag field are as follows:

i) The Carry Flag (C)

This flag is used to carry information on which arithmetic operations are performed. If, for example, two numbers are added to give a result greater than 255, the

carry flag is set so that you can take appropriate action. We'll discuss this when I deal with 16 bit arithmetic.

ii) The Overflow Flag (V)

Only the last seven bits are used for holding data, the eighth being a sign bit. Hence only numbers in the range +127 to -127 are used. If an operation attempts to store greater than +127, then the overflow flag is set. Again, we'll discuss at a later date.

iii) The Negative Flag (N)

This is set if an operation results in a negative answer.

iv) The Decimal Flag (D)

This is set if you wish to work in decimal (BCD) mode.

v) The Interrupt Flag (I)

Set if an interrupt is in progress.

vi) The Zero Flag (Z)

Set if an arithmetic operation gives a zero result.

The branch instructions test the status of a flag and act accordingly. The instructions provided are:

BCS — branch if carry flag is set
BCC — branch if carry flag is clear

BEQ — branch if zero flag is set
BNE — branch if zero flag is clear

BMI — branch if negative flag is set

BPL — branch if negative flag is clear

BVC — branch if overflow flag is clear

BVS — branch if overflow flag is set

You will generally use these instructions directly after an arithmetic operation. The most usual are:

CMP — this compares the accumulator to data or the contents of a location.

CPY — compares the Y register to data.

CPX — X analogue to CPY.

These three instructions perform a non-destructive comparison by subtracting the data from the register and updating the status flag accordingly depending on whether the result is zero, positive or negative.

Register = Data — set carry flag
Register = Data — set zero flag
Negative register is changed by the sign bit.

So to direct various results, you can:

Register = data — use BCS, e.g.
CMAP 14
BCS LOOP
branches to LOOP if accumulator holds four or more.

Register = data — use BCC, e.g.
CFF 10
BCC LOOP
branches to LOOP if Y register holds less than 10.

Register = data — use BEQ, e.g.
CPS 16
BEQ LOOP
branches if X register holds six.
Register = data — use BNE, e.g.
CMAP 13
BNE LOOP
branches if accumulator does not hold three.

If you now look back at last month's examples you will see how these tests are used. Arithmetic instructions such as INC, JNC, INC, DEC, INC change the negative and zero flags depending on the result. JNC and DEC increment and decrement a memory location by one.

My answer to question two from last month's homework uses this effect. Line 168 increments the counter. When it reaches 255, adding one more will result in zero. Since this signifies that we have finished, I use BEQ line 176 to detect this situation.

Now we've collected together the basic tools, let's start writing some decent

routines. In the last part, we discussed the use of NOP instructions to create delays. To achieve more substantial pauses we need to use more complex routines. Here is a simple delay routine:

```
100 ASSEMBLE T101
110 BISA "4C000
120 BISA LDA 010
130 BISA LDOP1: LTY 1310
140 BISA LDOP2: DEY
150 BISA BNE LDOP2
160 BISA DEX
170 BISA BNE LDOP1
180 BISA RTS
```

This routine uses a pair of nested loops to wait a short time. The values loaded into the X and Y registers in lines 128 and 130 decide the delay. Lines 140 and 150 count down the Y register to zero. This process is then repeated the number of times in the X register. The basic equivalent of this routine would be a pair of nested loops such as:

```
FOR I=0 TO 10: FOR J=0 TO 10: NEXT J
```

An alternative method is to call the routine at \$D185. This routine generates a one millisecond delay.

Let's use this delay routine to generate a progress twinkling pattern. Consider the routine:

```
100 ASSEMBLE T101
110 BISA "4C000
120 BISA LDA 16
130 BISA STA 998
140 BISA LDA 14
150 BISA STA 999
160 BISA LDOP: INC $D080
170 BISA INC 1600
180 BISA JSR DELAY
190 BISA JSR SETI
200 BISA BEQ FINISH
210 BISA AND LDOP
220 BISA JIN$40: RTS
230 BISA DEX: LDA 998
240 BISA LDOP2: LTY 999
250 BISA LDOP1: DEY
260 BISA BNE LDOP1
270 BISA DEX
280 BISA BNE LDOP2
290 BISA RTS
300 BISA ]
```

You'll immediately recognise lines 230 onwards as being our delay routine. The delay

parameters are held in locations 998 and 999 rather than being loaded as direct values. The line 128 to 160 set up the delay parameters. The rest of the routine is lines 168 to 210. It is an infinite loop which changes the colour of the border, delays a bit and then loops back. The subroutine call in line 190 runs the RUN-DOP1 key. If this key is pressed, then the Z flag is set. Line 200 checks this and stops if the flag is set. Try running along with the delay values and see the effect. If you use a bit of care and possibly the old NOP to fine tune it, you may be able to get some status entry coloured bars in the border.

The next, and last example, is a little more useful:

```
300 ASSEMBLE T101
310 BISA "4C000
320 BISA LDA 010
330 BISA STA 998
340 BISA LDA 010
350 BISA STA 999
360 BISA LTY 10
370 BISA LDOP2: LDA 142
380 BISA STA $4080.7
390 BISA LDA 01
400 BISA STA $4080.5
410 BISA TYA
420 BISA JSR DELAY
430 BISA TAY
440 BISA LDA 012
450 BISA STA $4080.7
460 BISA TYA
470 BISA JSR DELAY
480 BISA TAY
490 BISA LDA TABLE.7
500 BISA BEQ FINISH
510 BISA STA $4080.5
520 BISA TYA
530 BISA JSR DELAY
540 BISA TAY
550 BISA BNE LDOP2
560 BISA FINISH: RTS
570 BISA TABLE: 10:25,15:21,
580 BISA 16:12,17:10,18:15,19:14,1:0
590 BISA DELAY: LDA 998
600 BISA LDOP2: LTY 999
610 BISA LDOP1: DEY
620 BISA BNE LDOP1
630 BISA DEX
640 BISA BNE LDOP2
650 BISA RTS
660 BISA ]
```

Again the delay routine uses two locations to hold the parameters. This routine

simulates a device rather like the "indigirder" used on the Saturday afternoon football results service on TV. A message is simply printed across the screen with a flashing asterisk colour. The routine is quite simple.

Line 168 scans the Y register which will act as our counter. Lines 170 and 180 point an asterisk in the top left hand corner of the screen. Lines 190 and 200 update the colour matrix for you folks with old ROM machines. The next three lines form a table. The TABLE and TAY either side of the call to the delay loop save the contents of the Y register since it is used in the delay. Lines 240 and 250 move the asterisk with a space and we wait a while longer. Finally, lines 290 and 300 make a letter from the table and put it on the screen. Line 380 checks for a zero value in the table. This is used to mark the end of the table so that the routine stops at the end of the message. Line 350 increments the counter and provided that we don't go over a value of 255, line 360 sends us back for the next character.

I realise that I'm spending a lot of time explaining how the routines work. As my progress, I will make briefer comments since you should soon be able to sort things out for yourself.

OK, homework time. First, I want a routine which will fill the entire screen with a specified character. I don't expect the best solution but I've told you enough for a crude but effective routine.

Secondly, I want a routine which will move a block of data from the top line of the screen to, say, the 20th line. A single line of data will suffice but you can easily move a to 255 bytes. This sort of routine is frequently used in a range of situations.

Finally, here's about a routine which will scroll the top line of the screen one step to the right with the leftmost character replaced with a space!

Last month we'll explore eight and 16 assigned arithmetic.

Teacher's Pet

Margaret Webb browses
through some readily
available educational
software.

The supply of new educational software seems to have dried up, so I decided to look around the local shops to see what was on offer. The answer seems to be, very little. The reason for this could be disastrous:

1. My hometown is poor for shops selling software.
2. The storeowners are very cautious about stocking educational software.
3. There may genuinely be little software.

I suspect that notwithstanding the claims of the value of computers for education, the reality is that education is poor business. Much more money can be made by selling games. The majority of games only require good programming whilst educational material requires detailed teaching knowledge as well as programming ability. These rather disappointing facts of life were only too evident at the last PCW show where a number of exhibitors stated that they were no longer interested in educational software since it had no future. This is all right and there quite a lot of the important pre-school work can be carried out with computer assistance with the software acting as a type of expert system (teachers aren't always teachers). For the older children, software can be used to provide revision material and to support conventional didactic methods.

While rummaging through the shops, however, I did see an interesting item: a new product, this is a triple pack of Hill MacGibbon software for a much less than the original price of one. Hill MacGibbon is an interesting company in that it has produced software for most of the popular computers. In some of these packages there has been collaboration with well known companies such as Collins and Pan.

In light of this, this is a good time to take a look at which packages are available for the CMT. The triple pack contains *Ballooning*, *Car Journey* and *Secret Agent*. Between them they provide quite a comprehensive package, each coming with a colour booklet dealing with diverse aspects of the topic and ideas for further work.

Ballooning

The title is self explanatory. The booklet deals with the historical aspects of

ballooning and then goes on to look at the Hindenburg disaster and how a hot air balloon works. The ability to read and use a map is very important when flying a balloon and this topic is also covered. The software provides a balloon simulator with controls showing year, altitude, fuel (it's a hot air balloon), rate of climb and atmospheric temperature. Using the information given on the instruments, you must guide the balloon over varying terrain. In this way, *Ballooning* covers aspects such as physics, map-reading, mathematics and geography.

Car Journey

This would appear to be a minor one since the software involves the operation of a light baggage business. In it you must run the firm and keep it financially viable. This is done by judiciously securing contracts to move goods from point to point and selecting the optimum routes. You get bonuses or penalties depending on whether to keep to the time limits. Naturally, you must attempt to choose contracts which add up at the starting points of other routes etc. It doesn't pay to run an empty truck! Different size vehicles are available to suit different size commitments.

The accompanying booklet deals with aspects of the car, how it works and its history. It also covers the history of roads and transport and the motorway system. A nice touch is an extract from Road Staff describing Road's discovery of the joys of motorway. The pack covers reading, mathematics, geography and mechanics.

Special Agent

This package puts you in the shoes of a budding James Bond searching Europe for the deadly enemy agent who's gone killing off your operatives. The game centres around a map of Europe showing the major cities. From time to time intelligence reports flash up at the foot of the screen. Some of these are in code posing additional problems. You must act on the received information and travel from city to city. You must choose your trains and planes from timetables.

As usual, the booklet covers subjects connected with the central theme. You are introduced to the elements of

cryptography, the capital cities of Europe and a little information on real life spies is given. It covers geography, reading, lateral thought and some mathematics.

Hill MacGibbon also offers a number of packages covering more specific subjects. Teaching the mechanics of reading isn't that much of a problem since children generally learn grasp the form of words. What is more difficult to grasp and contributes most to the subtleties of English is punctuation. Punctuation Pairs is a program intended to help in this area. The child is presented with a graded piece of text which has had all punctuation and capital letters removed. The child must read the text and attempt to punctuate it so that the meaning is clear. When he feels that all is finished, the program marks the result showing any mistakes. Surprisingly, finding the correct punctuation is quite tricky.

Technically, the program is slick with large legible text and the use of an animated man as the cursor. I highly recommend it.

The last two programs are for the younger child. First, there is *Picture Builder*. As the name suggests, this program allows the manipulation of basic shapes such as squares, circles and triangles for the creation of pictures. The shapes can be stretched, shrunk, rotated and painted to give the required effect. Multicolour mode is used to allow up to four colours. For those of you with printers, there is a hard copy facility — nicely done and easy to use.

Finally, we have *Rat's Rabbit Run*. This is a simple game played on a matrix of squares, rather like a board game. You must guide a number of rabbits to their homes and away from the hungry fox. The game tells you how many squares your rabbits may jump on each move. These jumps must be distributed between the rabbits. There are bushes in which the rabbits can hide, if the fox isn't there! The game ends when all rabbits are home or have been eaten.

This game requires tough and clever thinking to use a little logic, lateral thought and some reasoning skills.

The impressive features about Hill MacGibbon software are that a high standard of programming is used and there is a decent level of content. Unlike some educational material, there is evidence of real teaching input.

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**P Green brings you
some hints on saving
time and memory.**

TIME AND MEMORY CAN BE wasted when a Basic program contains a lot of numerical data statements. This article suggests ways in which you can save both, even as programs copied from magazines.

The Facts and Figures

If you have a lot of numerical data to be stored, there is a fairly quick and easy way to save time and memory. Save the block of memory straight on to the disk or tape and get the Basic program to load this data straight into memory instead of **POKEing** it in.

Time is saved by this method because when you use data statements within a program, you must first load the data in Basic form and then run the program to **POKE** the data into memory. This takes 12 seconds for the first half of the operation and 16 for the second half for each 7K of memory when using a disk drive. Alternatively, to transfer the data straight into memory from disk takes only five seconds for each 1K of memory. Of course, the saving is much greater if you are using tape since tape loading is a much more lengthy process.

Memory can be saved, both in the computer and on the disk or tape. In the computer, 7K of directly entered data, of course, takes up just 7K of memory. On the disk or tape, it takes up just over 7K of storage space. On the disk, this is five blocks. In the case of Basic data statements, besides occupying the 7K of memory once the program has been run, the Basic data also takes up memory - just under 3K. Altogether, this method actually uses just under 4K of memory. On the disk or tape, it takes up well over 7K of storage space - that is, 71 blocks on the disk.

Saving the Data

So, firstly, how can we save a block of memory? And secondly, how can we get our Basic program to load it again?

DATA, TIME AND MEMORY

This can be done in two ways. You can use a machine code monitor to save an area of memory. To do this you will have to get the start address of the block of memory that you wish to save and then calculate the end address and add ones.

Your machine code monitor, of course, must not occupy the same area as the memory which you wish to save.

The procedure should be as follows:

1. Load and run the Basic program, or at least the part which **POKEs** the data into memory.
2. Now the Basic program and load the machine code monitor.
3. On most machine code monitors, the instructions to save a block of memory is something like:

```
5 "file name",C800,C208,06
```

This will save the block of memory from **C000** (the start address) to **C0FF** (the end address) on a disk drive with the device number of 0 or 08 bits off for tape with a filename "**FILE NAME**". (You choose the filename although you do not actually need one for files saved on tape).

4. You may need to save more than one block of data, for instance, a block of character data at **C208** and a block of machine code data at **C400**. All you need to do for this is to repeat instructions three for the new block of data, leaving in mind that for disks you will need a different filename.

Another and possibly easier method is to alter certain pointers in the two page of memory so that you fool the computer into thinking that the block that you wish to save is a Basic program. The locations to note are 40 to 46 inclusive. Locations 43 and 44 are the low

and high bytes of the start of Basic which are normally one and eight respectively. (**256*8+1=2049** is start of normal Basic area). Locations 45 and 46 are the low and high bytes of the start of variables which is normally the end of the Basic program filename.

The procedure is as follows:

1. Calculate the start and end of the block of memory which you wish to save, not forgetting to add one to the end.
2. Calculate the high and low bytes from these figures in decimal.
3. Run the Basic program, or the section of it that **POKEs** the data into memory.
4. In direct mode, **POKE** in these figures into locations 43 to 46.
5. Save the block of memory by typing in **SAVE "filename".A,1** or **SAVE "filename".A,1**
6. Repeat this for other blocks of memory if necessary.

The Basic Loader

Now that you have saved your block of memory, how do you get your program to load it again automatically? There are two ways in which you can do this. The first is to write a short machine code routine to load the blocks of memory. The second is to add one or more lines to the beginning of your Basic program. The machine code method requires an understanding of how the **KERNAL** load routine works and would take too long to describe here. Instead, I will concentrate on describing the Basic method.

It is actually very easy to get your Basic program to do the loading for you. The most important thing to remember is that once the first block of memory has been loaded, the program will start again from the beginning and if you don't do something to prevent it, the

same block will be loaded again and again.

The first thing to do is save a copy of the full program, data statements and all, in case something goes wrong, and keep it safe. Next, remove the data statements and the **OSAD-POKE** routine and any error traps, and save the program again.

The first line of the program can be used to load the block of memory by using a line such as:

```
10 GOTO 1: IF <= THEN LOAD "filename".A,1
```

This filename is the same as the one you used to save the block of memory. If a tape is used, then first change the eight to a one, and then, don't use a filename. The figure one after the eight or one is required so that the block of memory goes back to wherever it came.

If there is more than one block of memory to load, another line needs to be added, as follows:

```
20 IF <= THEN LOAD "2nd filename".A,1 etc.  
etc., in the case of tape, the first line can become:
```

```
10 Goto 1: IF <= THEN LOAD "1,1"
```

Do not use a filename. This will load the first two blocks of memory loaded on the tape.

The way in which the loader works, is as follows:

1. When the program is run, 1-8.
2. At line 1, 1 becomes 1 and the first load takes place.
3. After the load, the program starts again at line 10 but the variable 1 is still 1. Therefore 1 becomes 2 and since this is not equal to 1, the program continues to the next line.
4. This will go on until all the blocks of memory have been loaded and the rest of the program can continue.

FONT FACTORY

Evelyn Mills looks at a new product from Impex.

THE FONT FACTORY (FF) IS AFTER named and works hard for you, doing overtime at your request!

Firstly, the requirements are a disk drive, printer and word processor. The printer should, for preference, be the Commodore Vic 705/7045 801 although directions are given for using a printer interface emulating the MPS 801 or 803. It is claimed that FF will work with most word processors with open sequential files and I have used Easyrite throughout with no problems; however it would be worth the while doing a double-check with the distributors before purchase if you have another word processor as some do not link up.

Noticably there is no manual supplied with FF; instead the program gets to work right away printing out full instructions using the directions given. The resulting 16 page manual is in two parts - one for Font Factory and one for Signwriter 84. Both are very well written and the full concepts of the programs are easily understood - no hidden complaints here!

Before using FF, create a file document with your word processor and save this to disk. There is no necessity to use the commands of your processor other than direct typing mode. However - and this is most important - your MS-DOS version is first at the beginning followed by (return). Should you wish to use a different font in the middle of your document, insert a new " (n)Z header, followed by (return). FF has eight in-built fonts with which to play around.

Having saved your file to disk, load FF and let it take over. Initially I suggest that you use option three to print your document (there are plenty of screen instructions to help you along). Essentially FF will ask you to define your first font by selection from a list of eight; this will then be processed for you. The second font style will then be requested and FF gets back to work. When you have defined the number of fonts in your document, a simple (return) will put you in the test

option. If you select the parameters given on the screen (a good idea initially) insert your document; when told to do so and FF will print your letters in the fonts selected, very simple indeed and very effective.

There are eight in-built fonts including Mono, Bold, Roman, Gothic and, most important of all, the Decorative. The latter gives you "true type face" of a high quality as its name implies.

FF is full of options using normal or double width letters and has a very comprehensive list of embedded commands for centering, setting line width, left and right margins, optional page numbering and line spacing. All these commands are specially screen controlled. Fonts may also be changed within your document (did I say versatile!).

More to come. You may define your own fonts, if desired, or editing ones. The whole process is extremely easy to use and 16 fonts may then be screened at any one time within your document, including the in-built fonts. Instructions are clear, concise and readily handled.

In effect you can create an entire character set or change characters from an existing set; if you do not like the A in Gothic font then change it! If you want to design the Greek alphabet - do it!

FF also has a signwriter program which may be loaded independently; there again instructions are readily handled, when complemented with the manual. This functions independently of a word processor, character widths are Normal, Mono or Double width and the output has two options; one selects print according to the printing characters in your slogan while the other selects total line printing (note - the word set in normal width prints a banner around two feet long!) FF will stop the printer if you have been too enthusiastic.

As in FF, fonts may be changed and stored on disk. There is one Standard font in signwriter.

I see no problems in this program, consider it excellent value for money and doubt if you will be disappointed with its performance.

A really professional tool, approachably priced and certainly "user friendly".

Scratchpad

**Our readers provide
more handy routines
to add to your
collection.**

This month we are pleased to print three short utility programs. The first of these comes from Steven Freeman from Duxington and is a list utility.

How often have you tried to list a program on the screen of your Cret only to have the line that you want scroll off the top of the screen before you can read it? (I did so you can do this listing along with the CTRL key but the program will scroll.) Steven's handy routine allows the speed of the LIST command by changing the list vectors so that it jumps to where machine code routines in spare memory locations 679 to 703. Line 30 of the basic loader contains the PCOL that alters the speed of the list, you can change this if required. The other controls are:

- 11 To pause the listing
- 12 To slow down the listing.

For all of those people who have stored machine code programs on tape only to forget where they load in memory, Idris Pappas from Little Norton has provided an extremely handy Tape Header Reader program. The routine is very handy for locating a machine code program and giving its length.

This routine is reliant on a machine code calling the kernel RCOL which searches for any header to a program. The information is then stored in

PROGRAM: CATALOG

3 MEN PROGRAM FOR THE PLUS11

```
10 00=10000:END:END 001 MASTER TAPE PROGRAM CATALOG 000 10001:CLR*
12 POINT0
20 PRINT:READ:FOR=1:TO3:READ:PRINT "00:NEXT1
25 PRINT:DOWN:IN PROGRAM 1:PRINT:DOWN:ENTER THE PROGRAM NUMBER: (INPUT)
30 IF=0:GOTO:END02
35 POINT0,7
40 POINT0,7
45 POINT0,0
50 IF=0:GOTO:END03
55 IF=0:GOTO:END04
60 PRINT:DOWN:PLEASE WAIT FOR PROGRAM TO BE FOUND
65 POINT0,10:IF=0:GOTO:END05
70 IF=1:GOTO:END06
75 POINT0,3
80 PRINT:CLR*:PRINT0:PRINT:DOWN:DOWN:PRESS THE STOP BUTTON ON THE CASSETTE
85 VOL=0:GOTO,0:IF=1:PRINT:DOWN:GOTO,0:IF=1:GOTO,0
90 IF=1:GOTO:END07
95 GOTO 10
100 POINT0:PRINT:DOWN:YOU ARE NOW READY TO :PRINT:DOWN:GOTO:END08
105 NEXT0:FOR=1:TO3:PRINT:DOWN:GOTO:END09
110 PRINT0:POINT0,10
115 POINT0,0
120 DATA 10:END NUMBER OF PROGRAMS
125 DATA*PROGRAM 1:....."
130 DATA*PROGRAM 2:....."
135 DATA*PROGRAM 3:....."
140 DATA*PROGRAM 4:....."
145 DATA*PROGRAM 5:....."
150 DATA*PROGRAM 6:....."
155 DATA*PROGRAM 7:....."
160 DATA*PROGRAM 8:....."
165 DATA*PROGRAM 9:....."
170 DATA*PROGRAM 10:....."
```


the reverse buffer, address 80B-81D, where it can be easily used.

The final routine in this month's Scratchpad is a very handy cassette tape catalogue system from N V News from Oxford. The object of the program is to allow things to be to either programs or subroutines stored on a master cassette.

The program as it stands will store 10 sections of approx 5K

in length on a C60 cassette but this could quite easily be changed to suit individual requirements. If you use the C-64's hard fast tape routine from our Feb 88 issue about 18 programs of 25K can be saved. The data can be altered to suit the names of your programs. Don't forget to put the program number at the start of each line as it is this that you will have to press to access that file.

PROGRAM: LIST

```
10 REM 'BLON LIST' - BASIC TAPES FROM PROGRAM 1994
20 REM CPU = PAUSE : OF11 = BLON DOWN.
30 POKE 251,248 : REM SPEED OF LIST
40 FOR C=0 TO 21:READ A(C):C=C+1:POKE 174,C:POKE 182,
NEXT C:
45 IF C=12:GOTO THEN PRINT "DATA CANNOT READ"
50 POKE 174,167:POKE 175,2
60 DATA 75,145,171,201,4,144,206,204,3
70 DATA 198,8,145,201,155,162,145,162
80 DATA 48,252,104,76,26,167
```

PROGRAM: TAPE HEADER

```
10 PRINT "C64" : POKE 3200,0:POKE 3200,1
20 GOSUB 170
30 PRINT "DOWN, RIGHT TO NEXT TAPE AND PRESS A KEY."
```

```
40 SET A:IF A=0 THEN 40
50 PRINT "C64"
60 GOSUB 170
70 PRINT "C64"
80 GOSUB 170
90 POKE 164,14:PRINT "DOWN, RIGHT PROGRAM NAME:"
100 POKE 164,2:FOR I=0 TO 840
110 PRINT CHR$(PEEK(164)):NEXT I
120 PRINT
130 IF PEEK(160)=164:POKE 160,1
140 IF PEEK(160)=164:POKE 160,1
150 POKE 164,14:PRINT "DOWN, RIGHT START ADDRESS:"
160 POKE 164,2:PRINT I
170 POKE 164,14:PRINT "DOWN, RIGHT END ADDRESS:"
180 POKE 164,2:PRINT I
190 POKE 164,14:PRINT "DOWN, RIGHT 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000
```

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TRILIGIC



FROGGY

Daryl Flowers shows

you how to kill the

frog!

WELCOME BACK TO THE saga of the frog. This month we will be adding the routine which controls the status panel at the bottom of the screen, and the routine which kills the frog. Although the latter will not function until the checking routines are added to the next issue.

Info

The routine begins by printing the value of LRV15 on to the status panel. CPM17 indicates whether the frog is dead or alive and if dead (CM17 = 1), then we exit from the routine.

The next four instructions print the values in F00D and F00D+1 and the following seven use the X register as an index to point to the five digits of M17003 and M0001 and to place them correctly on the screen.

One of the features of the game is that it becomes more difficult as you progress, and this is achieved by increasing the speed of the BIRD and the FLY. Their speed is increased by a small amount every time another 100 points is scored. The next two lines store the current digit in the 100 column of the score into M17014. The code which carries out this value is speed appears later in the routine.

Lines 18218 to 18183 decrease the two byte delay M17041 and M17042 to check whether another move has passed. If not then we jump to F002, which simply returns from the routine.

The next eight lines use the X register as an index to increase the M17015 value if the digit being increased reaches nine-plus-one in value, i.e. 10; then the digit is set to zero, and the next highest digit is increased. M17016 contains the value which is placed back into

18201 18200

18200 18201,18202,18203,18204,18205

18206

18206 18207

18208

1

18209

18209 18210

18211

18211 M17015

18212

1

18213

18213 M17016

18214 18215

1

18216

18216 M17017

18217

1

18218

18218 M17018

18219

1

18220

18220 M17019

18221

18221 M17020

18222

18222 M17021

18223

18223 M17022

18224

18224 M17023

18225

18225 M17024

18226

18226 M17025

18227

18227

18228

18228 M17026

18229

1

18230

1

18231

18231 M17027

18232

18232 M17028

18233

18233 M17029

18234

18234 M17030

18235

1

18236

18236 M17031

18237

18237 M17032

18238

18238 M17033

18239

18239 M17034

18240

18240 M17035

18241

18241 M17036

18242

18242 M17037

18243

18243 M17038

18244

18244 M17039

18245

18245 M17040

18246

18246 M17041

18247

18247 M17042

18248

18248 M17043

18249

18249 M17044

18250

18250 M17045

18251

18251 M17046

18252

18252 M17047

18253

18253 M17048

18254

18254 M17049

18255

18255 M17050

18256

18256 M17051

18257

18257 M17052

18258

18258 M17053

18259

18259 M17054

18260

18260 M17055

18261

18261 M17056

18262

18262 M17057

18263

18263 M17058

18264

18264 M17059

18265

18265 M17060

18266

18266 M17061

18267

18267 M17062

18268

18268 M17063



10740	DN24		11260	LDA #17
10748	POD	RTD	11268	STA F000
10756			11280	STA F000+1
10760			11288	LDA #0
10768			11300	STA 000
10770			11308	LDA #0FF
10778			11316	STA F1F0L0
10780	LDA 000		11320	STA 0000L0
10786	AND 000000		11328	LDA #1
10800	RTD		11336	RTD PLT000
10810			11340	RTD 000000
10820	000000		11348	LDA #1
10830	LDA 0017		11350	RTD PLT000
10838	STA 0017H		11358	RTD 000000
10840	AND		11360	LDA #1
10850	STA 0017H		11368	RTD PLT000
10860	LDA 00000		11370	RTD 000000
10870	LDA 000000		11378	LDA #1
10880	AND 0001		11380	RTD PLT000
10890	LDA 00001,7		11388	RTD 000000
10900	AND		11390	LDA #1
10910	STA 00001		11398	RTD PLT000
10920	JMP 0000		11400	RTD 000000
10930			11408	LDA #1
10940	LDA 00001,7		11410	RTD PLT000
10948	JMP 0000		11418	RTD 000000
10950			11420	LDA #1
10960	LDA 0000		11428	RTD PLT000
10968	STA 00001		11430	RTD 000000
10980	STA 00001		11438	LDA #1
11000			11440	RTD PLT000
11010	LDA #0		11448	RTD 000000
11020	RTD 00000		11450	LDA #1
11040	RTD 00001		11458	RTD PLT000
11060			11460	RTD 000000
11068			11468	LDA #1
11070			11470	RTD PLT000
11080	SEC		11478	RTD 000000
11090	LDA #00000000		11480	LDA #1
11100	STA 00000		11488	RTD PLT000
11110	STA 00000		11490	RTD 000000
11118	LDA #00000000		11498	LDA #1
11120	STA 00000		11500	RTD PLT000
11130	AND L1000		11508	RTD 000000
11140	JMP 0000		11510	LDA #1
11150			11518	RTD PLT000
11160	LDA #1		11520	RTD 000000
11168	RTD 0000		11528	LDA #1
11170	JMP 0000		11530	RTD PLT000
11180	LDA #0		11538	RTD 000000
11190	RTD 0000		11540	LDA #1
11200	JMP 0000		11548	RTD PLT000
11210	LDA #0		11550	RTD 000000
11218	RTD 0000		11558	LDA #1
11220	JMP 0000		11560	RTD PLT000
11230	AND 0000		11568	RTD 000000
11240	LDA 00000000		11570	LDA #1
11250	STA 00000		11578	RTD PLT000
11260	LDA 00000000		11580	RTD 000000
11270	STA 00000		11588	LDA #1

NOTE112, so by changing this value (line 1080) you can adjust the distance that must be traveled before the value of NOTE110 is increased.

The same principle used for increasing the counters is used next to decrease F0000 and increase 001001.

Which brings us to DN24. If the value of NOTE104 is different to the current value of 00000+2, then it is time to decrease the delay which causes the speeds of the RED and BLUE, BAREFO and F0000. Finally they are checked to ensure that their values have not decreased too far.

Dead

This routine prints the dead frog and decreases the value of LIVES.

The first step is to check whether the variable CHD has been set by the collision routines which we will add next time.

Lines 10020 to 10030 set up the spin definitions to point to the correct spins for a dead frog. 10040 to 10050 simply set up the correct X and Y co-ordinates of the frog (the would look pretty silly floating in mid air). Next the values are set up in lines 10050 to 10060.

Now the interesting bit. Remember the interrupt handling routine, THANDIF that we added in the second article? Well, unless we stop this from being called, the dead frog will continue moving (initially the background would move, not the frog).

To stop this from happening, we point the interrupt vector at 00014 and 00015 to the end of the routine, thus preventing no code.

The rest of this section is simple to follow, and does this. Decrease lives, pause, repaint status panel, pause, set up interrupts, until F0000, reset RED and its position, reset CYCLE position.

The last pieces of code from line 11000 onwards, are simply delay loops used by the previous routines.

Panel image is copyrighted

LANGUAGE

This month David Janda
begins a look at C — a very
versatile programming
language.

LAB-C

C IS AN APPLICATIONS LANGUAGE. That is, it's used by programmers to write a variety of programs such as text editors, programming utilities and such like. It is also the "flavor of the day" in the micro world. Partly because of the popularity of the UNIX operating system (of which C is the language) and partly because of other features such as its compactness, portability and speed of execution.

The good thing about C is that it is a language for programmers. Many programming languages get designed by committees, but not C. C has gained its popularity not because of any hype or backing from a government (as the USA has backed ADA), but because programmers like C.

So what is C, what can you do with it, and how good is it?

Why C?

C has many virtues. It is a modern language which incorporates modern control features. It is also a compact language. C can be installed on small micros — such as the 64 — and the code that it produces is compact and fast. Another benefit of C is that it is portable. We have all heard claims that this or that language is portable, only to discover that a major rewrite is necessary before a program can be run on a different system. But with C it really is portable between different computers. If any changes to the source code are necessary, it usually means altering a few lines in a "header" file which can accompany the main program.

For those of you who are interested in the "real" world of programming, it is worth noting that C is the programming language of the UNIX operating system. UNIX is already an accepted operating system in the PC world, and the BBC have decided to adopt it as their official operating system.

C is a compiled language. The programs (referred to as source code) is first written using a text editor or word processor. The source code is then

submitted to the compiler, which, providing there are no errors, will compile the program into machine code and store it as a file which is called the object code.

The steps in developing a C program are a bit more complex than what was mentioned above, but it should give you a rough idea.

C BASICS

Here is a small C program:

```
1) #include <stdio.h>
2) main () /* This is a demo */
3) {
4) int num;
5) num = 1;
6) printf ("I am a simple");
7) printf ("computer.\n");
8) printf ("My favourite number is 1,
because it is first.\n");
9) }
```

This will print to the screen:

```
I am a simple computer.
My favourite number is 1 because it is first.
```

On a line analysis, this is what the program does. (note line numbers are not part of C). Line one tells the compiler to incorporate information found in the file `stdio.h`. Every C program must incorporate at least one function, and line two identifies the function called `main` (the parentheses are there to identify `main` as a function). The open curly bracket identifies the beginning of the function body. Line four is a declaration statement, here the variable `num` has been declared of the type `integer`. In line five `num` has been assigned with the value one and line six to eight print the output.

Line nine indicates the end of the function.

The "1" instructs the micro where and in what form the value held in `num` is going to be displayed. The "\n" means new-line carriage-return.

In next month's article I shall explain data types and control structures.

C Power V2.4 by Pro-Line Software Ltd

To the best of my knowledge, the C power package is the only C compiler available in the UK so far. By the time you read this a cheaper package called Super C should be available from First Software, the reason for this longer-than-normal review is to give you an idea of what the package offers and is capable of, as it is not the cheapest available!

On with the review! C Power is a complete C development package that will enable the user to produce stand-alone C programs. Most language packages available for the 64 fall into one of two categories: educational or development. Educational packages (such as the ADA tutorial) do not offer a comprehensive package that can be used to develop software. Instead, the emphasis is on introducing the user to the language. Development packages on the other hand (such as OCS and Orpheus Pascal) offer an excellent package, but are not too good when it comes to documentation. I was therefore surprised with C Power, because it is a very "full" compiler offering lots of facilities as well as providing an excellent tutorial book that used in conjunction with the compiler will enable beginners to learn the language.

The package itself consists of a double sided disk which contains the compiler, shell, libraries and example programs. A 44 page user guide gives details on the compiler and very little else. The big plus is the C Primer Plus book that is also supplied with the package, and which can be regarded as a complete tutorial to C.

Implementation Details

One of the benefits of C is its portability — the ability to run C programs that were written on other machines. Because of this compatibility is an important factor when developing a C package. Pro-Line

has got a very compatible package with C Power, but of course, there are some differences.

In brief, the omissions from standard C are: no bit field manipulation; static pointers may not be initialised except for character pointers initialised with strings; certain operators under certain conditions will not work unless the expressions are parenthesised. Most of these omissions are not serious, and can be got round quite easily.

The following table lists the size, in bytes of all data types supported by the compiler:

Type	Size
char	1
short	2
int	2
long	2
unsigned	2
float	8
double	8
pointer	2

Looking at the table, you can see that types short, int and long are the same, as are float and double. This practice is not uncommon in micro implementations of C, but is a strange one. For a package of this price I would have expected to see long and double supported.

The library supplied with the C Power compiler is quite standard. However, it would have been a good idea to include functions dependent on the 86, such as some sound and graphics functions.

Documentation

The user manual is supplied as sheets of paper which is stapled near the top.

Punch holes enable the manual to be fixed into a ring binder, which is a good suggestion in my copy started to fall to bits after a short while. The manual itself makes no attempt to teach or introduce the user to C - that's left to the tutorial book. Instead the manual provides information on the implementation of C Power and descriptions of the editor, compiler, linker and so on. One section lists the functions provided with the library that is part of the package. The majority of functions are listed with name, number, order and type: the function takes, description of the function and an example. A good idea this, as it will enable the user who wishes to port C source from another machine, to check up on functions to see if they are compatible.

The book 'C Primer Plus' by Walter, Prentice & Martin (Barns, \$19.95, ISBN 0-672-12889-5) is supplied with the C Power package. Quite simply it is the best language tutorial book I have ever read! This hefty tome (501 pages) takes the reader from the concept of programming right up to detailed discussion on C I/O. What's more, it is well-written in a friendly (and amusing) manner with plenty of illustrations, summary pages and so on. Even if you don't intend to get the C Power package get this book!

C Power in Use

The user manual suggests that the system disk should be formatted up. To do this, the shell, editor, syntax checker, linker and/or compiler should be copied on to one disk. Another disk should be used to copy the flag file of the system disk; this contains the \$Shell, I and \$Link, I Function Libraries.

The compiler itself is copy protected (not very well though) so three working copies are made, three disks should be at hand: One containing the shell etc; another the libraries; and the third being the master disk.

The Shell is the first program that is run when using C Power. Shell is itself a mini-command interpreter. It supports command line arguments and I/O redirection along with the compiler and other programs that are designed to work under it. The nearest comparison would be Basic's screen editor, which can be used to develop, edit and run programs as well as issue I/O commands (such as disk directory, opening files etc). The command available from the Shell are listed in Table 1.

Entering some C source code first requires the editor to be loaded and run. This is simple done by entering 'ed' optionally followed by a file name if an existing file is to be amended. The editor is a very comprehensive bit of code that provides numerous commands for moving about the text buffer. Once the code is written it can then be used to disk. A syntax checker is also provided which does what its name suggests - checks the syntax of a C source file. The program is listed as it is being checked, and will stop if an error in syntax is found. If this is the case, a message of key press and you are back into the editor at the place where the error was found. Needless to say that the editor, syntax checker and all the other Shell commands are written in C!

The next stage is to invoke the compiler by entering `cc filename`. This loads and runs the compiler which produces an object code file.

The first stage is to load and run the linker. This will produce an executable file and three options are available. First it is possible to produce a C program that will run under the Shell (just like the Shell commands). It is also possible to specify a starting address, this means that the C program will have to be loaded and a SYS call made to the starting address. The third option is to produce a file that starts at the start of Basic.

Summary

Without a doubt C Power is a very powerful package. It is quite feasible that it can be used to develop commercial programs, and its numerous features give the user a great deal of flexibility.

The only drawback with C Power is its price. It's a very expensive package, and I would have expected such things as more C64 dependent functions, long integers and double precision floating point.

Having said that, in price for everything the cost, and I would recommend the C Power package to the novice as well as the professional.

TABLE 1 - COMMANDS SUPPORTED BY THE SHELL

l	list work disk directory
ls	list system disk directory
rm	remove file from work disk
mv	rename file on work disk
cp	list contents of a file on work disk
cd	used command string to work disk
load	load, but not run, command from work or system disk
work	show or set device and drive numbers
sys	as above but for system disk
ed	load and run editor
csd	load and run syntax checker
cc	compile C source
link	run linker

NOTE: All the commands are followed by arguments such as file names, drive or device numbers.

William Fong adds a
little more power to
your MPS

BETTER MATRIX

Simply type it in as you would any other program and SAVE it. When you RUN it, any typing errors in the data will be found and the line of the error given. Correct any offending lines and run again until the program runs without any errors. Do not attempt to use the program before all errors have been found or you could cause your machine to crash.

Once the program is in memory you can get rid of the header by typing NMR. Then type M5 49152 to initialize letter matrix. A 30 line matrix page should be displayed showing you the simple controls that are needed to use the program.

Trying It Out

When everything is working type in the short program in figure 1. Now press function key 1, which will give a blue border, and RUN the program. Not very nice is it?

Now press function key 1, which will give a cyan border, and RUN the program again. This time the letters will have descenders.

Better matrix should therefore give a better appearance to many of your programs. However, as each word-processor is different it is impossible to say whether it will work with them loaded into your machine. At the moment better matrix sits in memory location \$C400-49932 so it will definitely not work with programs that use this area of memory.

THE COMMANDER1 MPS 801 is an extremely popular printer because of its cheap price. If you are only after the occasional computer listing then it is quite adequate. A problem arises however if you wish to use the MPS 801 to produce quality text output as none of the lower cost letters have descenders. This means that a letter 't' would simply sit on the same line as a letter 'a'. This makes it very difficult to read large amounts of text.

If you want to enter the wonderful world of word-

processing and are thinking of trading in your MPS 801 and purchasing a more expensive printer then wait a minute. Before you take any money out of your depleted bank account take a look at Better Matrix.

So how does it help? Well Better Matrix uses a dollar method of printing in the more expensive, near letter quality (NLQ) printers. First one part of the letter is printed then the printer goes back over the letter and adds the missing parts of the letter to the page.

By implementing this on the MPS 801 we can obtain an acceptable print resolution of 14 dots by 16 dots. Obviously this does not improve the definition of the characters as proper NLQ does, but it does allow you to print characters with descenders. Take a look at figure 1 which shows the normal printout of the MPS 801 compared to that of the revised matrix.

However, printing in this manner does have a disadvantage. As the printer has to go over each line of text more than once it takes a lot longer to print out any text, this is not only common to the MPS 801 but all NLQ printers suffer in the same way. On the MPS 801 the speed is reduced from 30 characters per second to 20 characters per second.

Getting It In

Better matrix is quite short and the program is all in machine code but is processed best in the form of a Basic loader.

PROGRAM: BETTER MATRIX

3000 FOR L=0 TO 99999

1700 G=0 TO 255:G=0

1200 C=0:R=0:R=0:R=0

40000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 G=0:R=0:R=0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

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3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

3000 READ A:IF A=0 THEN GOTO 10000

10000 0

COMMUNICATION

If you've never heard of
bulletin boards or you just
want to know how to get on
one — read on. David Janda
shows you how.

I HAVE BEEN ACCUSED OF DOMINATING Communication Corner with ATN/CHT blarney. Well, as promised, here is a refreshing change. This month the subject is bulletin boards.

A bulletin board (BB) from now on can be compared to a community bulletin board. A BB is usually run by a host who has her own spare area on a home micro with disk drive and auto-answer modem. A BB will allow one user at a time to browse through the files stored on the board. These can include messages from other users, general information, special-interest info, you name it you can put it on a BB.

Compared to Microsoft or CompuLink (I know I would mention them sometimes!) BBs are not technically brilliant, but they are by no means crude. One of the best things about using different BB's (board-making is that they are not homogeneous, official or run by money makers — and that makes a difference!)

What Type?

The UK currently has over 200 BBs that operate at regular times, and the number is growing. These are basically two types of BB from which to choose. First there is the traditional scrolling type of BB. To access this, you will need terminal emulation (often referred to as dumb

terminal) software. Most comm packs include this type of facility. In case you are a Viewdata (Prestel) user who does not have this type of package, Daphnet on page 1006 (7/80) at £1.50 should get you going. CompuLink users can purchase TTY which is at T14007 for £4.95.

This type of software does not give you any colour or graphics, but enables you to log on to most types of BB.

The second type of BB operates on Viewdata (Prestel-like) standards. This type of board presents information with colour and low-res graphics in a page format. Microsoft-Prestel subscriptions will not need to buy any additional software, but CompuLink subscribers will need the free Viewdata pruggy at 2030. Again, with the dumb terminal software, most comm software has a Viewdata mode.

Which Modem?

Most of the BBs are run at 300 baud. This means that you'll need a modem such as the Voyager 2, Nightingale or Multi-modem from Atroads Technology. All these modems will also allow you to access boards at 1200/75 Prestel and scrolling formats. CBT modems owners need not be lulled into by. Many boards now allow access at 1200/75 baud, and some even operate at 1200/1200.

What's There?

Each BB has its own unique character. But most have an E-mail (Electronic Mail) option that enables you to send and receive messages. These messages can be private, i.e. to another user, or be posted on the general board for everyone to see. Other features on BBs typically include free downloadable software. Downloading is done in several ways, but by far the most popular is the X-Modem format, so check to see if your comm package has this option. Another common feature to be found on BBs are the file — Special

Interest Groups. These are areas which contain information on one particular subject such as a micro, comm, political whatever.

There are many other features to be found on BBs. Some even have on-line adventures that you can play.

When using a BB, it's worth remembering that the service which you are using is two-way. That is, it's up to you, the user, to help supply the board with information. Have you got any software (not your own!) that you wish to upload for everyone to use. How about asking the System Operator (SYSDOP) to set up an SAC dedicated to Commodore machines if there is not one there already!

The List

Opposite is a very small selection of BBs that are currently in operation. All the boards listed operate on a 24 hour basis. V/Data means that you will need Prestel type software to access the board. 1200/75 means that you need scrolling type software and a modem, such as the one from CBT, to access the service. Finally, BB means 300/300 baud access which needs scrolling software. CBT modems users will not be able to access this type of board.

All the boards listed have a section which contains phone numbers for other boards. Have fun!

What About the 64?

To the best of my knowledge, there are only three bulletin boards which are run on the Commodore 64. One is in Denmark, one in Dublin and the third in Amsterdam! No doubt there are quite a few in the good old US of Reagan which I shall check out soon enough. I also understand that there is some public domain (free) BB software knocking about in Ireland which I shall also track down. As you can see before, running a Bulletin Board on a C-64 is perfectly feasible.

COMMUNICATION

CORNER

Message	Telephone	Notes
SALES 1	0284 276386	800
Station One	01 728 8713	V/Data
Cashel Bar	0222 464 778	V/Data
C-View	0702 548373	V/Data
SBBS Swansea	0792 287953	800
Crusade at Home	01 688 8894	V/Data
Hackney 88	01 585 3332	V/Data
Hunting Thomas	0712 34499	800
Livingston 88s	090 63826	800
London 88	01 465 6687	800/1275
London Underground	01 863 0786	800/128475
Martel	01 591 1719	800
Mailbox-88 (Liverpool)	051 438 8024	800/128075
Martinet	01 591 4385	V/Data
Norview	0904 20441	V/Data
TEBS Bedford	0258 54404	800
TEBS London	01 548 9480	800/128475/128075

Below is a printout of part of a session on SBBS Aberdeen which is on 24 hrs a day, at 800 based on 0234 787913, eight hrs no parity. SBBS is running a C-128 with a 1541 disk drive. The 246 of software rewrites by Nigel Gaskin, the 3type using the Brite Basic compiler, not fast eh?

The time is 04:31:15 One moment loading.
SPACE BAR/pause/escape, CTRL Input
SBBS Main Menu (3)
B-Power/Bulletin Board Info
C-Goodbye/Log-off
H-Help with this section
M-Messaging Area
U-User Log
X-Exit for SYNOP

2-Goto Main Menu (2)
1-Print this menu again

EGJHMLLY.2
or 1 for menu 1

The time is 04:31:35 One moment loading.
SPACE BAR/pause/escape, CTRL Input

SBBS Messaging menu

C-General message
H-Help with this section
P-Personal messages
S-Synop messages to/from

1-Goto Main Menu (1)
2-Goto Main Menu (2)
1-Print this menu again

CHP3SY.1.2
or 1 for menu 1

The time is 04:31:55 One moment loading.
SPACE BAR/pause/escape, CTRL Input

SBBS General message
C-Check Mail
D-Delete a message from file
H-Help with this section
M-Message categories
Q-Quick read of messages
R-Read message(s)
S-Send message(s)
1-Main Menu (1)
2-Main Menu (2)

CDJHMQRSY.1.2
or 1 for menu 1
One moment loading

File message 1 1 Last message 3 4

Message number: [From] [To] <CR> enter
E:4-4

One moment loading.
Message 34 (general) section

MESSAGE TO: ALL
MESSAGE FROM: FERGUS McDONALD
SUBJECT: ANOTHER C884 BBS!
DATE: THURSDAY 30/ 3/88
LINK IS A JOIN MEMBER

Hi folks! I have set up a BBS in Dublin, Ireland, running on a Commodore 64 with 8052000 and 2 disk drives. I am a heavy C884 fan. The BBS software (in me) is called SBBS. It is an interpreter - no manual! And it is all in machine code. Give it a ring and you will see; it is QUITE different. It is refreshing to see another BBS running on a Commodore 64. Also, what does all this of the new SPS 1001 C884 disk drive with 1Mbit per disk!! Anyway, the board (run by me) for the Irish Amiga Computer Club is called the AMCBBS, and is in Dublin 900141 (24 Hours) on 8 hrs, no par, 1 step, 800 baud

CDJHMQRSY.1.2
or 1 for menu 1
One moment loading

Last but not Least

Well that's it for another month. I shall be reviewing at least two machines and some commo packages. Finally, a special mention to Richard James (CHIT 880) who wanted his name to appear in THE magazine in 884 column. And said! Don't forget to drop me a line on Compuserve ID D.JANDA or Postal 91898267.

CORNER

STATESIDE

NEWS

Lewis Tilley gives you the update from across the Atlantic.

HAS THIS BEEN FOR COMMODORE the "winter of discontent", or just a winter of the big freeze? In the US programs like Freize Ittime from Cardon, and here from Starpoint Software, seem to reflect in their names the low point reached by Commodore's stock. By midwinter it had slipped to its lowest level ever of 10, down from an all time high of \$60 on the NY Stock Exchange.

In this great company on its way out? How can a company that has sold over four million units of the C64 be in such trouble? Even this past Christmas it is rumored that 80% of the sales were of the old reliable, that the C128 was so sluggish that an artificial shortage in the C64 was created by holding back supplies of them in the east coast. Other gossamers were that the C64 was "warehoused" in order to take its price and/or to reintroduce it in a new case with some fancy new touches. The above rumour, incidentally, also through the courtesy of Felix Rivera who writes in what perhaps the outstanding computer support group publication in the US, "The New York Commodore Language Network News" is published monthly in newspaper format. To subscribe, write Brian A. Glover, Editor, 428 Clinton Avenue W, Brooklyn, NY 11218 USA. Its cost in the US \$12.00 a year. Cheap, cheap, cheap.

My contact with user groups was greatly expanded by attendance at the 1986 West Coast Commodore Association "Commodore Show II" this February in San Francisco. At least a dozen groups were represented, leading the field was the grand daddy of them all, The Toronto PC Users Group, followed by such US giants as the Oregon Based US Commodore Users Group, P.O. Box 2310, Roseburg, Oregon 97405 USA, and the above mentioned NYC conglomerate. No less than nine smaller California groups were listed in the show catalogue.

What's a BIG West Coast computer show like? Turned packed with people and programs! The people were a little older on the average than those I've seen attending the shows at Earl Court on the International Commodore Show in London last year. But they were definitely not like the three-piece suit, business types that I saw in San Francisco at an IBM compatible software show that was being held at the same time.

New to the programs, which I mentioned earlier, Freize Ittime by CARDON, Inc., 300 S Topoka, Wichita, KS 67202 will quietly sit inside your computer, totally transparent to any other programs you may wish to load and use. Then when you want to make a screen dump, you call it with two key strokes and voila, the frame is frozen and sent to your printer. You then continue to run whatever you may have at your main program.

Don't confuse two different programs coming from the US both called Snapshot. One is a utility from COMPUTE's Gazette magazine written in machine language which can store whatever you have on the TEXT screen (up to 51 screens) and then retrieve it for display or for printing. The other is a cartridge named Snapshot 64 which comes from those fine people at C64 Software, Inc., P.O. Box 583, Crown Point, Indiana 46037 who developed the best of the 1541 Disk Drive Alignment Programs (buy the Version 2.0 at \$44.95 plus shipping).

Snapshot 64 is touted as the "ultimate" backup utility since you are able to "snap" most any program after the protection check and then resume...totally bypassing the protection check. Price as this utility is \$69.95 plus shipping costs.

Remember the exciting advertisements from Starpoint Software of Quincy, CA 94607? They announced a utility called STARDISK which would do everything more makes great copies. Well, they were blocked from releasing it by a lawsuit slapped on them by SEI/ES Electric Works, 2111 South Wisconsin Road, Mountain View, CA 94041. Styles says that it was too much like their car-

tridge 1541 FLASH (\$19.95 - on sale, plus \$15.00 US shipping charge) which was developed by the same computer expert.

Starpoint is delivering one of the bargains of the year. They are marketing a 256K RAM board for the Amiga functionally identical to the Commodore 1028 RAM board for \$99.95 + \$6.00 shipping outside the USA.

Incipit, which is also a Starpoint product at \$44.95, is a combination hardware and software package that closes this little survey of new utilities. It "de-protects" by capturing and saving the protected program as it runs in the 64's memory. This "snapshot" (so help me, they advertise this one as a "snapshot", too) becomes accessible to the user for complete inspection and alteration. The quotation is from Starpoint's advertisements.

The midnight modern madness continues. Commodore associated QUANTUM LINK is giving away a 300 baud autodial modem if you subscribe for four months at \$4.95 monthly. Viewtron charges you only \$49.95 for a 300 baud "talks 4800" by Anchor Automation. They show in a first hand on Viewtron for free. Playnet gets a bit tricky in its combination offer of a magazine subscription to RINGY, a Playnet membership kit and a modem if you subscribe to Playnet for three months and pay a first time membership fee of \$19.95.

The flow has certainly come to Amiga. Hardware prices are falling and software is flowing from the developers like watered up maple syrup. The Electronic Arts Deluxe Paint program begins to really show what this amazing machine can do in presenting visual ideas. What's more it integrates with the Deluxe Graphics, Music and Printing modules of the same company. The games have arrived too. Flight Simulator from Sublogic, Napoleon at Waterloo by Krestel Software, Skyfox and a re-issue of the Software Golden Globes, Li, Peng, Illux, Adventure and Life from US are available now.

The C128 is less fortunate in the because of new programs designed especially for it. True, some very fine old programs are being updated such as Viperite and Superfont. And now that Commodore has issued a new version of CP/M for the 128, which really works this time, all those wonderful old CP/M business programs are there for the taking.

I may be including a mention of the PC 10 in upcoming columns if the announcement by a PR that's Public Relations (US english) man for 9-PRIS Information Services is true. Commodore is going to try and hit the business world with a wire service which is compatible with IBM machines. They'll distribute the PC 10 in the US to clients who want the service compatible with IBM and may even offer a free Plantix to the less fluent businessmen who want to try their service. This will all be tied in with QuantumLink to give a triple total service as well as find a use for all those great (and useless) PLUS/OS.

Joe Nicholson

continues his look at

the C-16. This month

— clocks and timers.

IN THIS ARTICLE I SHALL attempt to explain some of the techniques involved in timing, interrupts and so on. I shall start with the keyboard interrupt as this is the easiest to explain. Every 1/300th of a second the computer interrupts its normal processing to execute a 'service routine'. This updates the clock and reads the keyboard, putting any new keys pressed into the keyboard buffer. It then resumes processing. The address contained in bytes \$0014 and \$0015 use the low and high bytes of the indirect values for the location of the interrupt. These values can be redirected in order to make the C-16 jump to your own machine code routine. This method was used in the play routine and the synthesizer article explained last month. After the user routine has been completed the program can then jump back into the service routine to update the counter etc. Alternatively it is possible to jump straight back into processing.

The interrupt is normally on. The machine code instruction \$E1 turns the interrupt off and C11 will turn it on again. The following routine will set the interrupt vector:

```
$E1 interrupt off
LDA low byte
STA $0114
LDA high byte
STA $0115
C11 interrupt on
RTS return
```

Similarly to restore the original interrupt:

```
$E1
LDA $01
STA $0114
LDA $01
STA $0115
C11
RTS
```

Note that most of the programming associated with interrupts has to be done in machine code for speed, for instance it is not possible to disable the interrupts from basic. At the end of the user interrupt routine use the instruction (JMP \$0008 to return

PROGRAMMING

THE C16

to the service routine. To jump back from the user routine to continue processing, ignoring the C-16's service routine, use the instruction (JMP \$0008 (J00 a0). I won't include a demonstration of this type as the play command published in the December 1985 article on sound, and the sound synthesizer article published last month serve as fitting demonstrations.

Internal Timers

There are three internal 16 bit timers in the C-16, the timers operate at a frequency of 800 KHz on our PAL system machines, it therefore takes an 0.00125 seconds to count all the way from \$0000 to zero. Timer #1 has the facility of being able to activate an interrupt upon reaching zero. Each timer is arranged as two eight bit registers in memory, using the normal protocol of high byte i.e. multiples of 256 hex, preceded by the low byte remainder 0-255.

The registers are arranged in memory as follows:
 \$0100 Timer #1 low byte
 \$0102 Timer #1 high byte
 \$0104 Timer #2 low byte
 \$0106 Timer #2 high byte
 \$0108 Timer #3 low byte
 \$010A Timer #3 high byte

To set a timer simply load the timer's registers with the starting value, it will then count down to zero. As the timer will obviously have to be set in two parts, (one P000 or STA for the low byte and one for the high byte), there should therefore be a delay of no greater than 125 ps between writing the low byte and the high byte, otherwise the timer will start to count down and therefore to be set incorrectly.

To eliminate this problem, obviously, the timer registers should be set in machine code using the following type of routine:

```
$E1 disable interrupts. (we don't want a keyboard
```

interrupt to occur between writing the low byte and the high byte)

```
LDA low byte of start time
STA low byte of timer
LDA high byte of start time
STA high byte of timer
C11 turn the interrupts back on
RTS return
```

The Timers and Interrupts

Timer #1 is a main sophisticated timer that times P1 and P2. When this timer is written to, it sets the time to that value as requested, but also sets the 'timer #1 reload register' to that value. The timer then counts down to zero, at which point an interrupt is generated if bit three of the interrupt mask flag is set. Bit three of the interrupt status register is then set. The timer is then reset to the reload value, and the counter carries on decrementing until it reaches zero when another interrupt is generated etc.

Timer #1 is a potentially a very useful timer allowing periodic interrupts of specified delay length, for instance timers are used to generate accurate inter-bin delays in a tape loading system which is under development.

Timers #2 and timer #3 are simpler timers. These timers go back to \$0000 after they have reached zero, instead of being reset to a reload value. They still have the ability to generate interrupts when they reach zero however. To turn interrupt for timer #2 on/off, set/reset bit six of the interrupt mask register. When the interrupt takes place, bit six of the interrupt status register is set high.

The Interrupt Mask

The interrupts are turned on and off by setting/resetting bits on a register called the interrupt mask at \$F05A or decimal \$2206. Bits one to

seven control the following:
 Bit 1 timer interrupt
 Bit 2 light pen
 Bit 3 timer 1 interrupt
 Bit 4 timer 2 interrupt
 Bit 6 timer 3 interrupt
 Bit 7 interrupt request

Setting a bit high on the mask byte will enable the appropriate interrupt. Bit 2 light pen! There is no connection for a light pen on the edge connector, but there may be on the joystick port.

The Interrupt Status Register

This byte (at \$F059 or decimal \$2205) records which interrupt has interrupted. It is important for the interrupt service routine to know just which interrupt has been used so that it knows how to act. The arrangement of bits in this register is the same as the interrupt mask register (e.g. Bit four is the timer #3 interrupt bit). Strangely, to set a bit 'on' in this register, write that bit with a zero. Similarly write the bit with a one to reset that bit. Any interrupts from the C-16 are recorded by the C-16 setting the appropriate bit of this register.

Timer Interrupts

It is interesting to note that the three timer interrupts can still be used even when the timer and interrupt requests have been disabled with the \$E1 command. This is the technique used in the saving and loading of programs in the C-16. The routine at \$0184, for instance (Figure 1) is used before loading/saving a block/ header in the C-16. The routine at \$0179, shown in Figure 2, is the opposite of the routine of \$0184 and is used after loading/saving a block/header.

However it is not always necessary to perform timing routines using the method

described above, thanks to a very useful ROM routine at \$2EA. If quite accurate time delays are all that are required, the routine at \$2EA can be used. Calling this routine will generate a delay of 1/50th of a second. This routine is used to generate delays in the typing/loading routine, e.g. the 1/5 second between printing **LOADING** or **LOADING**, and turning the screen off on **screen/hold** is:

100% OF THE
 100% OF THE
 100% OF THE
 100% OF THE
 100% OF THE
 100% OF THE

Note that as the routine of MEIA turns the interrupts off to get better timing, the COI command is used to re-enable them if you want them on again.

The Next

The registers \$0013 and \$0014 are the low and high byte pointers for the 'update clock' routine which is called every 1/200th second by the C-16's service routine. This is usually set to \$C342 but can be redirected to go to a user routine. Figure 3 shows the assembly test for a clock which displays its time continuously in the top right hand corner of the screen. It also has an alarm with sound and a facility to jump to a machine code routine upon the event of an alarm. The clock redirects the pointer \$0013 and \$0014 (\$78 and \$79) to a new service routine stored at \$9040. The whole machine code program is 306 bytes long and resides between \$9000 and \$9736, a free area of memory in the C-16. To type this in use the C-16 assembler published in the June 1983 copy of Your Commodore. Alternatively Figure 4 shows the code for this program in data statements with a machine code loader at \$9000 to POKE the bytes in. The time and the alarm time can all be set with Basic commands. The routine is stored at \$9000 (2554 decimal).

Description of Clock Program

Lines 104.28-104.38 initialize the routines over variables.

```

Lines 10080-10080 turn off the
clock by relocating the
'update clock' routine to its
original value.
Lines 10090-10090 turn on
clock; above 'update clock
routine' becomes service routine.
Lines 10090-10700 set time. To
set the time, user: SYS1077,12-
41:15. The latter three numbers
are the time in hours, minutes
and seconds. The system for
scanning the line used in the
subroutine will be explained in
a later article on extending the
Basic. Line 10090 then turns the
clock on.
Lines 10800-10910 set the alarm.
This works in the same way as
the 'set time' routine. It is
located at 111000 (4:157
decimal), or SYS1007,12-41:15
sets the alarm and initiates it
so that it sounds for 30-seconds
when the alarm time is
reached.
Lines 11200-11290 = clock
service routine.
Lines 11300-11390 count each
1/20th second (jumping to
16245 if the next second has
not been reached).
Lines 11300-11340 update
seconds.
Lines 11400-11540 update
minutes.
Lines 11550-11680 update
hours, switching back to
00:00:00 after it reaches
23:59:59.
Line 11700 calls the routine
which handles the alarm sound
if it is on.
Line 11710 calls the routine to
print the time on the screen.
Lines 11700-11680 check to see
if the alarm time has been
reached by comparing the time
(1077-1080) and the alarm time
(1079-1080) byte by byte.
Lines 10900-10990 the alarm has
been reached. Line 11700 calls
the alarm sound subroutine
which starts the alarm sound if
it is required.
Lines 11930-11980 call a
machine code routine whose
address is stored in bytes 92
and 93, if 92 is on.
Lines 12000-12200 = Alarm
routine. This handles the 30
second delayed alarm if it is
on.
Lines 12185-12200 are
concerned with making the
beeping.
Lines 12300-12600 initiate
alarm sound. If an alarm has
been reached and the register
$14 is > 0 to signify that the
alarm sound is enabled, an
alarm sound is generated in
voice 2.
Lines 12610-12670 set the
duration to 30 seconds.

```

```

Lines 12540-12544 set the
frequency.
Lines 12628-12658 'on' video 2.
Lines 12660-12679 select a
display.
Lines 12800-12810 Print time.
This prints the time in the top
right-hand corner of the screen
if it is 0.
Lines 12898-12899 set up the
colours for the text. This is
initially set to W (black) but can
be set to other colours by
POinting address 347.
Lines 12900-12910 print the
characters of the time on the
screen.

```

Figure 5 shows a list of all the system variables used in the program.

Note that the machine code jump routine cannot last for any longer than 1/50th second. At the end of the routine a `PRINTF` should be used to exit the routine.

In conclusion, the case of the clock, first of all initiated by James in 1921-22

714-336-7861

For more information, contact
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200 1F0A+*THANE+AA+*THANE
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**Bill Bremner begins a series
designed to help you get the
most out of your disk drive.**

PROGRAMMING THE 1541

BEFORE I TRY TO EXPLAIN HOW THE 1541 Disk Drive works, let us discover what brought about its unique design and unravel some of its peculiarities.

Most modern computers employ an all-singing, all-dancing (often expensive) floppy Disk Controller or DDC to connect up to a disk drive. A software package called a Disk Filing System (DFS) or Disk Operating System (DOS) is then loaded into RAM or plugged in as ROM and manages the controller, to perform such tasks as formatting, reading, and writing. Of course, the more complex the DFS or DOS required, the more space it takes up inside the computer (the BBC micro uses the plug-in ROM method). Apple and Atari both load their software into RAM. There are quite a few advantages in using this type of system: fast loading and saving, and a variety of increasingly complicated and fashionable drives. However, the reliance on memory usage restricts the

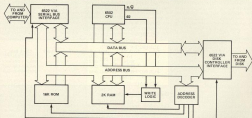


Figure 1:

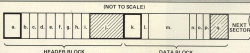


Figure 2:

versatility of supporting software, data storage is, as the whole, too efficient, and incompatibility problems often arise with third-party tape software.

The 1541 Disk Drive evolved from the 1540, which was designed for the Vic-20, and, because of the limited amount of memory in the Vic, Commodore had to find a way around a memory-based DOS. So was born the 1540, an intelligent serial-bus device which controlled all its own formatting, reading and writing, as well as intricate sequential and random-access file handling. Unfortunately, it was serial (slowever), not parallel (fast), and it had quite a few bugs (at sometimes thought it was a dual drive), but, after all, anything was better than tape. When the Macintosh on the home computer scene, I was decided a new disk drive should follow with it, but as the Vic was still selling, the new drive would have to be compatible with that too. So was born the 1541, still slow, still with bugs, but relatively cheap, quite efficient, and pretty reliable.

Because the drive is intelligent, and thus self-supporting, there is no need for either disk controller or dedicated disk software inside the 64. The control unit inside the 1541 is a 6502-based computer much like the Vic or 64, with 8Kb, 80Kb and interface chips. This means that at the end of your serial line is a fast storage device, which, with a little understanding, can be programmed much the same as the host computer it is attached to.

Inside the 1541

If you are prepared to open up the 1541 you will find relatively little inside that looks like a computer. The circuit board, sitting atop the motor transformer and the drive mechanism, contains the control electronics at the front end, and the actual computer circuitry at the back. This is much more sparsely than the Vic or 64 boards, as it needs neither audio nor visual related chips. Two 6522 Versatile Interface Adapters handle serial bus communication and control the drive mechanism, as well as supplying timing and interrupt facilities for the processor. The Disk Operating System software is held in two 8K ROM chips, and 3K of RAM not only provides the necessary workspace for the 6502, but is also useful as buffer storage. A handful of other support chips, including an address decoder, complete the quota.

1541 Block Diagram

The 1541 of DOS is split into two sections: the Interface Processor or IFP for short, which manages the host computer related functions such as file manipulation and serial bus communications, and the Floppy Disk Controller or FDC which controls the Read-Write head and data storage. The 6502 Processor has to share

time between the FDC and the IFP, which also reduces the effective operating speed of the 1541. The FDC, IFP and Interface Chips will all be elaborated on individually as the series progresses, together with a full RAM memory map.

Disk Format

In order for the DOS to find its way around the disk a format routine is used to divide the disk surface up into tracks and sectors. Tracks are formatted in all, each one being the first and outermost, and track 35 the innermost, with the directory on track 18. Each Track is further divided up into 17 or more 256-byte sectors, numbered zero upwards. To pack as much data into the available space, Commodore adopted a scheme where the number of sectors on a track increases the further out, and thus longer, the track is. However, this method by itself would not have worked because even if the Read-Write head is positioned on track one or 35, it still takes the same amount of time for the disk surface to rotate past. The larger the track, the higher the velocity it has when it passes under the head, so to counter this the data is actually written and read to and from the disk at a faster rate depending on how far out the track is. The data bits are "clocked" in and out at approximately 300,000 bits/sec on the outermost tracks and 250,000 bits/sec on the innermost. The track layout is divided into four different zones:

Zone	Track No.	Sector Range	Sectors/Track	Clock Rate
1	1-17	0-20	21	307,000 bits/sec
2	18-34	0-30	31	305,714 bits/sec
3	35-36	0-17	18	304,667 bits/sec
4	37-38	0-16	17	293,000 bits/sec

Data Encoding Scheme

Commodore again opted for a more space-efficient recording method to store the individual bits on the disk. The most commonly-used storage scheme is bit

(frequency Modulation) which involves writing a stream of clocking bits, with a data bit occurring in between if a "1" needs to be written. This is expensive in data storage space and so the 1541 was designed to use a self-clocking method called Group Coded Recording (GCR for short (Apple micros also use GCR). Prior to being written on to the disk, every data byte is converted into a form which can neither be confused as a sync mark nor affect reading accuracy. This is achieved by splitting the byte into two halves, or four bit nibbles, and using a look-up table in the ROM to convert each half into a five bit result.

For example, to convert the eight bit byte 1A5 (10100111) into GCR, the byte is first split into two four bit nibbles, 1010 and 0111. Using the conversion table these nibbles now become 10101 and 01111 respectively, and so our completed GCR byte is 101010111. Using Group Coded Recording, no combination of any five bit GCR nibbles will ever produce nine consecutive binary ones (used as a sync mark), and no more than two consecutive binary zeros will appear in a 10-bit GCR byte or combination of bytes (this is not speed accuracy when clocking bits back into the 1541 during a read). However, we now have a problem when manipulating the data. The 6502 can address only one eight bit byte at a time, whereas our new byte is now 10 bits long. Therefore the conversion routine inside the DOS actually converts four bytes at

the same time. This is the minimum amount of bytes that can be converted by an eight bit processor $4 \times 10\text{-bit bytes} = 40\text{ bits} = 5 \times 8\text{-bit bytes}$. Thus, when writing data, four eight bit bytes are collated and then converted into four GCR 10-bit

GCR Table

Hex	Binary	GCR	Hex	Binary	GCR
00	0000	01010	08	1000	01001
01	0001	01011	09	1001	11001
02	0010	00010	0A	1010	11010
03	0011	00011	0B	1011	11011
04	0100	01110	0C	1100	01101
05	0101	01111	0D	1101	11101
06	0110	00110	0E	1110	11110
07	0111	00111	0F	1111	00101

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**Stuart Cooke takes a look at a
new range of disk based
budget software.**

IF YOU'VE EVER WANTED TO BUY A wordprocessor, database or any other type of business software for use with your Commodore computer then you will have been amazed at the price. It is not unheard of for over £100 to be asked for a wordprocessor. A few companies, notably Supersoft and Massmart, have produced a few cheap, 'professional' programs at around the £75 mark. Now a new range of disk based budget software is set to hit the stores at a price of only £7.99. This makes it far cheaper than a great deal of software that is available on cassette.

So what's the drawback? A disk for only eight quid must have at least one fault. Well, there are a few quibbles out in getting this software out so cheaply. There is no fancy packaging. A clear plastic pack is used so that the disks can hang on pegs in shops. There are no manuals with the software, the instructions on the packet simply tell you how to load the program. Finally, most of the programs are in Basic.

Don't let any of the above factors put you off the software though. The lack of instructions is usually - I say usually because one important program has no instructions - made up by very clear help options within the program. Even though many of the programs are written in Basic they all work extremely well and do what they should. In fact many of the programs in the range work better and look better than their more expensive competitors.

The name of this new range of software is Load'N'Go! The range is imported over from America. In the States the programs sell extremely well in supermarkets with a price tag of around \$5. Who knows, we may soon be able to buy a Wordprocessor at the same time as our car tires.

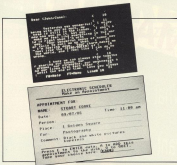
Load'N'Go! software falls into a number of different series. The series that is being marketed over here at the moment is the 'Business Management Series'. A lot of this range of software could be put to good use in either a small business or at home. Its main purpose is to make life easier for you.

So what's the software really like? The best way to answer this question is to have a look at some of the packages individually.

Love Letters

At £7.99 Master Word must be the cheapest wordprocessor available. It has many of the functions of its dearer competitors such as search and replace and the ability to set line spacing and margins. It doesn't however lack the more 'up market' fancy bits such as page numbering and headers and footers. Another

BUSINESS



Wordprocessor is due to be released at a later date that will have all of these facilities plus many more.

As wordprocessors go this one isn't particularly fancy. It will however regenerate your latest masterpieces without complaining at all. In fact if you're not too good with the old pen a selection of Business letters (You're fired etc), Home letters (Birthday etc) and love letters (Track 15) are provided on the disk.

Adding it up

Another program in the series is 'Personal Spreadsheet'. This one is a little disappointing. For a start there are no clear instructions anywhere. There are no help functions, except with the different types of calculation. This means that the only way to figure out what the package does is to actually use it. If you have never come across a spread sheet before then I suggest that you find out what one is and how it works before you look at this program. If you have already used a spreadsheet then you will more than likely be disappointed with this package.

Really 'Personal Spreadsheet' is a glorified calculator. You can store numbers in the columns and rows and then perform simple calculations on them. You cannot set up formulas in locations as you can on other spreadsheets. Since a spreadsheet is supposed to help you if you have a lot of formulas to work with, I think this program is the biggest let down of the pack. A normal calculator will perform the same job as this program, and a lot quicker.

On Time

If, like me, you are always forgetting appointment events or forgetting what time you are supposed to be somewhere, you will find 'Electronic Scheduler' a treat.

This program is used for recording all appointments. You are asked for the name of the person who the appointment is for, this means that you could put the whole office appointments into this program. What time and date the appointment is, who the appointment is with, where it is and any comments that you need.

Once you have entered in the data you can search for all meetings for a certain person after certain dates. You can be all

ON BUDGET



meetings between dates. It is even possible to print details of all meetings at a certain place or with certain people.

How on earth did I ever manage without this one?

Money Matters

A couple of financial organizers are included in the series. These are 'Pro Financial Organizer' and 'Home Finance Organizer'. Both disks offer checkbook and address list programs while the financial organizer also has a calendar and the Home Finance package has a budget program.

One very nice feature in the Mail List manager on the Pro disk is the ability to code names and addresses, with say an 'F' for friend or 'B' for business. When you want to print out your labels you can then print them out for just one group.

A very nice 'extra' is the Christmas card list. For each record you must specify whether you want them on your Christmas card list or not. You can then get a count of how many Christmas cards you will need and then get the computer to print out all the labels.

The calendar is one of those silly 'PLEASE GIVE ME THE YEAR' type of programs. You know, you give it the year and the month and it prints out a calendar for you. One extra feature is the ability to highlight a specific date. This would be great if you could highlight all dates with say birthdays of friends but since you can only highlight one day in every month this is probably out of the question. What a silly fault!

The titles explain the functions of the other programs on these disks and I don't think that I need say anything more about them apart from that they work well. In fact if you used either of the checkbook programs you would know exactly how your finances were at any time.

Both disks are good in certain areas. If you want addresses then go for the Pro Finance pack. If you want budgeting and checkbook then I think that the Home Finance pack is a little better.

The packs are so cheap that it may well be worth buying both.

More Info

If you require more information with your address file then you could have a look at the Home and Business Card File disk.

This is very similar to the address programs that are mentioned above but it also allows fields for business and telephone numbers. I did have a few problems with this program. For a start there wasn't enough room for many of the addresses that I tried to enter and secondly they are in the American format of City, State and Zip. Since the programs are in basic it would only have been a simple task to turn these formats into 'English'. It may more be possible to make the changes yourself.

Even better than this 'g' base. This is a proper database program. By program, I mean that you can define your own fields for data entry. This means that if you wanted to make an address list you aren't stuck with ZIP etc. If you wanted you could even use the program to keep a catalogue of your records or stamps. In fact 'g' base can be used to store information about anything that you could put on a card. Having the information on computer means that it is a simple task to find specific details or print out a list etc.

Keeping Tabs

Obviously with disk software becoming so cheap the number of disks in your collection is bound to grow. How on earth are you going to keep track of them all?

Well, 'Disk Utilities' will solve this problem for you. This program will store information on up to 100 disks. You can search for a specific program and you will be told what disk it is on. You can get a print out of the directories of all your disks. It is even possible to print out a list of all the IDs that you have used. As you are probably aware the Commodore disk drive uses a two digit ID to identify each disk. If two disks have the same ID, the disk drive may not know if you swap the disk, thus messing up the contents.

The list of used IDs is printed in the form of a grid with letters and numbers being across the top and edge of the grid. It is now easy to mark off new disks as you format them.

As well as the catalogue program there is also a utility program. This will allow you to backup disks (not protected ones), format disks etc.

At a price of only £7.99 this disk is a must for any disk drive owners.

Verdict

Most of the programs available are around the same quality as a good magazine listing. They are all functional and do what they set out to do without any frills.

At £7.99 this software should make a very big impact on the home/small business market, perhaps with the same sort of impact that Muretonic made when it launched its £1.99 tapes.

Who knows, good business software at this price may make people start to use their computers for something other than games, this wouldn't be such a bad thing.

IN PRINT

Eric Doyle has been trying out a real hardware bargain.

WHEN I READ THAT THE IBICO LTR-I printer claimed letter quality printing and that the price was less than £300, my immediate reaction was, to say the least, one of disbelief. After unpacking the box, I remained unmoved; the printer head looked very Mickey Mouse-ish but when I tried printing my attitude changed.

Surprisingly, the machine does produce letter quality and it does so in a very novel way. The printer head resembles an office date stamp. You know the kind, rotate the wheels to get the correct date, then ink the rubber-faced letters on a pad and stamp away. In this novel letter printer the characters are carried on a cylinder which carries four bands of characters. At the back of the wheel is an inked cylinder which brushes against the letters as they rotate and each character is pressed against the paper when required to produce very high quality letters. High-tech will have a place for the good old principles pioneered by Gutenberg!

The limitation of the printer lies in the fixed roller idea. The characters you get are the ones you're stuck with. No graphics screen dumps or characteristic Commodore symbols, just plain and simple alphanumeric and punctuation.

The paper is friction fed through the printer with no facilities for tractor feeding. This means that as a cheap printer for wordprocessing applications it can use high quality, bonded paper. Indeed, a good wordprocessor would be a boon to anyone owning this machine because it doesn't have a 'paper out' indicator. When the printer reaches the bottom of a page, the rollers lose its grip on the paper and the head carries on printing to and fro across the same line. A wordproc with the facility to stipulate a page length would overcome this fault.

For most people the main application they would look for is the ability to print out listings of their latest project for a relatively deluging session. Obviously the problem here is that most listings fill

more than a sheet of A4 paper and estimating how many lines to a page would be a nightmare. I found that normal A4 tractor feed paper would not fit the platen mounting but you can buy paper which is A4 width including the perforations and this is fine for most purposes as long as the paper doesn't slip in the platen rollers.

Control of the printer is limited to the basic character codes of the Commodore. For example, CHR(10) followed by CHR(13) will initiate a line feed and force the printer to the beginning of the next line. CHR(26) sets the printer to normal line spacing and CHR(20) will allow double spacing for extra clarity.

The number of characters available is limited to 126. This includes all the alpha-

numeric characters. Because the printer has to move up and down the paper frequently, this means that a speed of 18-20 characters per second is the maximum that can be achieved. In real terms this means that a 60-line page of A4 text will take about five minutes to print which is not too bad considering the quality.

The total size of the printer is about 12 inches by nine by two, which means that it takes up very little room on a desk and the only control is the paper advance and the on/off switch so it is not too complex to use.

My only qualms about this machine are the tendency of the friction feed to slip and the problem of what happens when the print head wears down. To be



numeric characters and punctuation marks. In the main these correspond to Commodore's version of ASCII but some of the characters around CHR(90) vary. The most important difference is that the pound sign has an ASCII value of 115 instead of 92 but a little bit of thought should overcome this problem.

Despite the Heath Robinson appearance of the printer, the quality of the printout is excellent. After a while the letters may get a little faint or the width of their outlines become broken but this can be remedied by the simple application of more ink on the roller giving a result indistinguishable from the quality of a typewriter.

The speed of the printer is comparable

fair, mine is a review machine which may have seen hard use at the hands of others and the resilience of the printer head seems to promise a fairly long life.

The cost of the printer should be seen in the light of the need for a ceteris paribus interface. I believe Books tell one for around £20, so if you're in the market for a cheap printer with high quality, small and you're willing to accept the 20th Century adage that budgeters can't be choosers, then this is definitely a machine to consider. The only other printers at this price are thermal printers and with the cost of thermal paper these days it could be worth while considering a machine with low post-sales overheads, in which case this could be the one for you.

[illegible][illegible]



HAVE YOU EVER WANTED TO GET INTO communications? Would you like to get in touch with other Commodore owners? Well, Your Commodore, together with Computer, are pleased to announce the start of Club 128, and give you the chance of a special membership offer.

Club 128 will appear on Computer as a 'free access' area open to all CNET subscribers.

The club will be the focal point for all 'serious' users of Commodore computers, hence the '128' affiliation. The 128 doesn't mean that owners of C64s can't join. In fact the club is open to all Computer members though only 'serious' users are expected to make a great deal of use of it.

Many sections of Computer are due to be 'pulled in' to this online area, including the 'Briefcase' business section that is already in existence.

Best of all, Commodore will have a magazine section within the club area where you will be able to find news and the latest programs that are published in the Magazine.

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